

THE DEVELOPMENT OF A MODEL TO MEASURE SELECTED  
ECONOMIC EXTERNALITIES OF EDUCATION

by

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THE DEVELOPMENT OF A MODEL TO MEASURE SELECTED  
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by

Lillian Dean Webb

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In a system of free public schools such as exists in the United States, the entire society must bear the costs of education, rather than solely the individual receiving the education. As society has made increased investments in education, the public has exhibited a growing demand for schools to be accountable. Formerly, educators have relied primarily on nonquantifiable justifications when referring to the social and economic benefits of education. These are not enough for policymakers in a world of increasing costs and inflation. They are demanding more than the traditional "educated-citizenry" justification for additional expenditures. Most researchers who have attempted to quantify the economic benefits of education have confined their measurements to one or two kinds of benefits or externalities. The most comprehensive measurements attempted thus far, those by Levin, had several apparent procedural weaknesses.

The purpose of the study was to develop a model to provide a procedure by which economic benefits of education to society might be quantified. In the development of the model, attention was given to:



1. A description and critical examination of the Levin procedure for measuring economic externalities with the review of related research used to support or refute the validity of each step.
2. The development of a revised model for measuring selected economic externalities based on the analysis of the Levin procedure, including procedures used by Levin that seemed validated by a review of related literature, as well as revisions of his procedures justified by the literature.
3. An illustrative application of the model procedures for measuring foregone income, foregone tax revenues, and costs of providing an adequate education to the sample of males aged 25 to 29 in the 1972 census. Costs of education-related welfare and education-related costs of crime were also calculated.

In applying the model, first, actual distribution of educational attainment of the sample is compared to hypothetical distribution that would result under a policy of high school completion. Second, lifetime income of the sample under the actual distribution is compared to lifetime income under the hypothetical distribution to obtain an estimate of national income foregone. Third, calculations of federal and state-local taxes as a percent of personal income are applied to the foregone national income to obtain the estimated loss in tax revenues. Fourth, the costs of providing the sample with a minimum of a high school education, as well as the college costs that would accrue by continuation of a portion of the sample on to college, are calculated. Last, to obtain estimates of the education-related welfare expenditures and education-related costs of crime, the categories of relevant

expenditures are aggregated and the midpoint of the range between an upper and lower limit is selected as being the best estimate of costs.

The application of the model indicated that society forfeits between \$137 and \$82 billion in foregone income, and between \$39 and \$23 billion in foregone tax revenues over the lifetime of the sample. The educational costs of providing the sample with a high school education, plus college continuance, were \$20 billion.

In addition, the estimated cost of education-related welfare expenditures for the year 1973 was calculated to be \$7.5 billion. Education-related costs of crime were estimated to be \$10.4 billion.

The data presented in the study suggest that schools are not only a national expenditure but also a national investment. Education serves not only as a determinant of national economic growth, but also as an instrument of social democracy by changing income distribution and disparities and by providing equality of opportunity.

## CHAPTER I

### INTRODUCTION

The economics of education is a fairly new subject with a long history. Indeed, in 1776, the economist Adam Smith wrote:

The expense of the institutions for education is . . . beneficial to the whole society and may therefore, without injustice, be defrayed by the general contribution of the whole society.<sup>1</sup>

Although these views were expressed almost two centuries ago, until quite recently the economic significance of education to society has been largely ignored. Only in the past few years have economists recognized the significance of education to the rate of economic growth and prosperity of the United States. Now, however, the relationship between economics and education seems to be universally recognized. A whole new terminology has come into existence; "investment in education" is employed as a substitute for "expenditures for education." Such terms as "the economics of human resources," "investment in human beings," and "human capital formation" have entered the literature.<sup>2</sup>

Most attempts to assess the economic benefits of education have explored the costs and returns of education in the realm of the

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<sup>1</sup>Adam Smith, The Wealth of Nations (New York: P. F. Collier & Son, 1905), p. 212.

<sup>2</sup>Jesse Burkhead, Public School Finance: Economics and Politics (Syracuse: Syracuse University Press, 1969), p. 1.

returns to the individual that are derived from the investment in education. Benefits internal to the individual and his family are referred to as private benefits. Weisbrod listed four broad categories of these benefits. They were: direct financial returns, financial options, hedging options, and nonmarket options.<sup>3</sup> Direct financial benefits take the form of the higher levels of income that correlate with higher levels of educational attainment. For example:

According to some recent figures, every day of attendance in high school increases a student's life-time earnings by \$218 over a person with an eighth grade education. Every day of attendance in college increases a student's life-time earnings<sup>4</sup> by \$329 over a person with a high school education.

A large body of literature has been developed which establishes the contribution of education to increased earnings.<sup>5</sup>

Financial options, according to Weisbrod, refer to the fact that the achievement of one level of education gives the individual the opportunity to acquire the next level of education and to gain the rewards accompanying it. A hedging option exists in that additional education increases the flexibility of individuals in adapting to new job opportunities or to technological change. This is important in

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<sup>3</sup>Burton A. Weisbrod, External Benefits of Public Education (Princeton: Princeton University Press, 1964), p. 17.

<sup>4</sup>Jerry Robbins, "Education as an Economic Investment," paper presented before a community meeting on educational topics in Okotona, Mississippi, February 21, 1972 (ERIC ED 064 773).

<sup>5</sup>Examples of the literature reflecting this are: Gary Becker and Barry R. Chiswick, "Education and the Distribution of Earnings," American Economic Review, vol. 56, no. 2 (May 1966), pp. 358-60; George Hanooh, "An Economic Analysis of Earnings and Schooling," The Journal of Human Resources, vol. 2, no. 3 (Summer 1967), pp. 310-29; George Johnson and Frank Stafford, "Social Returns to Quantity and Quality of Schooling," The Journal of Human Resources, vol. 8, no. 2 (Spring 1973), pp. 139-55; Randall Weiss, "The Effects of Education on the Earnings of Blacks and Whites," The Review of Economic Statistics, vol. 52, no. 2 (May 1970), pp. 150-59.

that the average individual will probably have to be retrained three to five times during his career. Nonmarket benefits result from the variety of activities an educated person can perform that an uneducated (or less educated) person cannot. Weisbrod gave the example of filing one's own income tax return. Weisbrod calculated that in 1956 alone this resulted in a savings to the total population of the United States of at least \$250 million.<sup>6</sup>

In comparison to the individual benefits, minor emphasis has been placed on what are variously referred to as the "social benefits," "indirect benefits," or "externalities" of education. These consequences of education confer benefits on other members of the community of the person to be educated, or on society as a whole rather than just on the individual. They may even reach into the future to bestow their benefits. This is possible as a result of the alleged intergeneration effect of education. According to Cohn:

The alleged intergeneration effects of education stem mainly from studies showing that a strong correlation exists between the education level of the parents and the likelihood that their children will embark on additional educational training as well. The implication is that the parents' education directly or indirectly results in increased educational investment by their children.<sup>7</sup>

As in the case of private benefits, these externalities may be economic or social in nature.

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<sup>6</sup>Weisbrod, op. cit., p. 25.

<sup>7</sup>Elchanan Cohn, The Economics of Education (Lexington, Massachusetts: D. C. Heath and Company, Lexington Books, 1971), pp. 130-31.

Social externalities generally represent less measureable benefits than those of an economic nature. For example, it is difficult to measure such social externalities as increased equality of opportunity or transmission of cultural heritage. For some social externalities, however, empirical evidence has been developed which attempts to show some of the benefits which accrue to society as a result of higher levels of educational achievement of its citizenry. For example, studies have shown a high correlation between educational attainment and political participation. Table 1 shows the voter participation in the 1972 presidential election by the years of schooling completed. Participation is shown as rapidly increasing with increased levels of educational attainment.

TABLE 1

Reported Voter Participation in the 1972 Presidential  
Election by Years of School Completed

Years of School Completed	Percent Reported Voted
Elementary: 0-4	33.0
5-7	44.3
8	55.2
High School: 1-3	52.0
4	65.4
College: 1-3	74.9
4	82.3
5 and over	85.6

Source: U.S. Department of Commerce, Bureau of the Census, "Voting Participation in the Election of November, 1972," Current Population Reports, series P-20, no. 253.

Persons with higher education are more able and more likely to become involved in politics and to influence the outcome of issues that affect them. Persons with lower levels of education are not only less knowledgeable concerning political issues, but are also less knowledgeable of political processes and are consequently less able to make their views heard even when they are aware of relevant issues.<sup>8</sup> Thus, a lack of schooling restricts one's ability to exercise his political rights, thereby weakening a basic democratic concept--the maximum political participation of an enlightened citizenry.

Some externalities might be considered both social and economic in effect. Weisbrod referred to these as "employment-related." The basic idea is that educating some workers raises the productivity of others.<sup>9</sup> Increased productivity of one worker may be illustrated by emulating a coworker and learning his skills, or by being influenced by psychological and motivational factors resulting from work association with more educated coworkers. Normally, workers with additional educational attainment have improved communication with management and coworkers, are more receptive to new ideas, and have greater flexibility and adaptability, qualities which are so important in a modern industrial society where production requires the coordination, cooperation, and interaction of workers.<sup>10</sup>

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<sup>8</sup>James W. Guthrie, George B. Kleindorf, Henry M. Levin, and Robert T. Stout, "School Achievement and Post-School Success: A Review," Review of Educational Research, vol. 41, no. 1, p. 11.

<sup>9</sup>Weisbrod, op. cit., p. 32.

<sup>10</sup>J. Ronnie Davis, "The Social and Economic Externalities of Education," Economic Factors Affecting the Financing of Education (Gainesville, Florida: National Educational Finance Project, 1970), pp. 65-66.

The purely economic externalities may be either positive or negative in their effect on society. If they represent additional benefits to society as, for example, increased national income or increased tax revenues, they are considered positive. If, on the other hand, they affect expenditures on other services made necessary by a lack of education, such as the increased expenditures related to crime and welfare, they are considered costs and are thus negative in nature. Historically, these economic externalities have not been given as great an emphasis as have been the individual economic benefits of education. In the last few years, however, several studies have been conducted which give consideration to this dimension of the economics of education. With the notable exception of the Levin work,<sup>11</sup> however, few of these studies have attempted to measure these economic externalities. Consequently, the focus of this study will be on the development of a model for the measuring of the economic externalities of education.

### The Problem

#### Statement of the Problem

The problem of the study <sup>10-6-0</sup>will be to develop a model for measuring selected economic externalities of education. In the development of this model, attention was given to:

1. A description and critical examination of Levin's procedure for measuring economic externalities.
2. The development of a model for measuring selected economic externalities based on the critical analysis of the Levin procedure.

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<sup>11</sup> Henry M. Levin, The Effects of Dropping Out, A Report to the Select Committee on Equal Opportunity of the United States Senate (Washington, D.C.: U.S. Government Printing Office, 1972).



3. An illustrative application of this model to a selected group of males 24 to 29.

#### Delimitations and Limitations

The study was confined to the measurement of the economic externalities associated with foregone income, foregone tax revenues, and expenditures for welfare, unemployment, crime, and law enforcement. The critique of the Levin procedure was confined to the techniques he employed; the question of the comprehensiveness of the Levin procedure in terms of the externalities with which he deals was beyond the scope of this study. The sources of data were restricted to U.S. Government documents relevant to the study. The illustrative application portion of the study was limited to a select group of males 24 to 29. The members of this group would theoretically be old enough to have completed their education but would still have a number of years left in their work careers. Females of this age group were not considered because census data reporting their lifetime income were unavailable. The study also had the limitations inherent in the process of logical analysis.

#### Justification for the Study

In a system of free public schools, the entire society must bear the costs of education rather than solely the individual receiving the education. Education has become one of the largest items in the public budget. Yet, educators, in attempting to justify the profitability of increased investments in education as compared to other forms of public or private investment, most often have given insufficient attention to the public, as opposed to the private, economic benefits of increased expenditures. With the growing outcry for accountability in a time of

increasing costs and inflation, growing numbers of economists and policymakers are not content with the analogy between physical capital and human capital, or with simply pointing out that the economy depends upon an adequate supply of educated manpower, but are demanding that some attempts be made to quantify the economic benefits of education.<sup>12</sup>

Bowen, writing in 1963, admitted that the attempt to assess the magnitude of the national returns to education "is the biggest unsolved riddle of all." Bowen further commented that a few researchers have attempted to make this assessment, "but all would agree that there is room for much more work on this problem."<sup>13</sup> Vaizey, in 1968, stated that the calculation of the benefits accruing to society at large "is the most realistic procedure for calculating the returns to investment in education."<sup>14</sup> As recently as 1971, O'Donoghue remarked:

In contrast to the extended qualitative discussions of the social value of education, quantitative estimates are sparse. As Becker remarks when introducing his own brief treatment of this aspect, "economists (and others) have generally had little success in estimating the social effects of different investments, and, unfortunately education is no exception."<sup>15</sup>

Because of the growing cry by many educators for increased financing of education from the national level, policymakers and educators

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<sup>12</sup>Maureen Woodhall, Economic Aspects of Education: A Review of Research in Britain (Windsor: National Foundation for Education Research, 1972), p. 6.

<sup>13</sup>W. G. Bowen, "Assessing the Economic Contribution of Education," in B. R. Cosin, ed., Education: Structure and Society (Baltimore: Penguin Books, Inc., 1972), p. 21.

<sup>14</sup>John Vaizey, "The Returns to Education," in Readings in the Economics of Education (Paris: UNESCO, 1968), p. 598.

<sup>15</sup>Martin O'Donoghue, Economic Dimensions in Education (Chicago: Aldine-Atherton, 1971), p. 93.

must be able to justify these expenditures in terms of the accruing benefits that are associated with these expenditures. However, as noted in the introduction, most studies which have dealt with externalities have been confined to the measurement of one or two kinds of externalities. Consequently, there has been a paucity of relatively comprehensive research. The most comprehensive measurements attempted thus far have been those by Levin. However, there are several apparent weaknesses in the Levin procedure. Given the paucity and the weakness of the Levin procedure, the model developed in this study provided a needed procedure by which the economic benefits of education to society might be quantified.

#### Assumptions

In this study, anything less than a high school completion represented an inadequate education in the lifetime of the sample of males. For the purposes of making the illustrative application, the conservative assumption was accepted that rates of continuation beyond high school for all additional graduates under a public policy requiring a minimum of high school completion for all citizens were the same as the rates of continuance for nonwhites. Also, from a desire to understate rather than overstate, the assumption was made that income differentials between whites and nonwhites would continue throughout the lifetime of the sample.

#### Definition of Terms

Ability adjustment--An adjustment made to income differentials to account for all the nonschooling influences such as sex, race, I.Q., or socioeconomic background that might affect income.

Aid for Dependent Children (AFDC)--A public welfare program that provides aid to families with dependent children under the age of 18, dependency being described by the death, incapacity, or continued absence of at least one parent.

Discount rate--The percent by which future income is discounted to account for the fact that income in future years might not be as valuable as income at the present.

Educational attainment--The level of education completed in terms of years of schooling completed.

Externalities--Benefits of education accruing to any others external to the individual being educated or his family.

Expenditure for crime--The cost categories of crime against persons, property destroyed by arson and vandalism, public law enforcement and criminal justice, and private costs related to crime.

Foregone income--Income lost to the nation having failed to provide a minimum of high school completion for all men in the sample.

Foregone tax revenues--Tax receipts lost to the nation as a result of the foregone income of the sample.

Welfare expenditures--Public expenditures under the categories of aid for dependent children, medical assistance payments related to AFDC, general assistance, and unemployment compensation.

### Review of Related Literature and Research

The review of the related literature and research in this section was limited to a historical consideration of studies which attempted

to determine the economic externalities of education. The review was also limited to published material. The review of the literature pertinent to each of the steps in the Levin procedure and to each of the externalities to be measured are considered as each appears in the description and the critical review of the Levin work presented in Chapter II.

The earliest attempts to assess the national economic benefits resulting from education were by what Bowen referred to as the "residual approach." Basically, the residual approach consists of:

Taking the total increase in economic output of a country over a given period of time, identifying as much of the total increase as possible with measurable inputs (capital and labor being the two measurable inputs usually chosen) and then saying that the residual is attributable to the unspecified inputs. . . . Education and advances in knowledge are usually regarded as the most important of the unspecified inputs.<sup>16</sup>

Schultz and Denison are generally considered to be the pioneers in the use of this approach. By obtaining data on the distribution of the labor force by years of educational attainment, earnings at each level, and costs of educating at each level, and then making an adjustment for increases in the length of the school year, Schultz found that the stock of education carried by the labor force, as measured by the costs of producing it, had increased by \$355 billion (in 1956 prices) over the period of 1929 to 1957. Of this, \$69 billion could be attributed to the growth in the size of the labor force. The remainder, \$286 billion, represented the increase in the level of the stock of education per laborer.<sup>17</sup> Over the same period, real income

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<sup>16</sup>Bowen, op. cit., p. 20.

<sup>17</sup>T. W. Schultz, "Education and Economic Growth: Return to Education," in Readings in the Economics of Education, op. cit., p. 300.

increased from \$150 to \$302 billion in 1956 prices. If the share earned by labor is assumed to represent 75 percent, its contribution increased from \$112.5 to \$226.5 billion over this period. If earnings per person had been held constant, however, labor would have earned only \$155.5 billion in 1957. Thus, workers earned \$71 billion more than they would have if earnings per person had been held constant at the 1929 level. This \$71 billion is the residual. By calculating three different estimates of the rates of return on the investment in human capital stock, 9 percent, 11 percent, and 17.3 percent, Schultz found that "the increase in the education per person of the labor force that occurred between 1929 and 1957 explained between 36 and 70 percent of the otherwise unexplained"<sup>18</sup> \$71 billion residual.

Schultz seemed to be primarily concerned with the quantity of education in the labor force, but a more important step might be to explore the contribution which quality of the labor force may have on output. This is what Denison attempted to do. Denison made the most detailed quantifications to date of the relative contribution of both educational quality and quantity to economic growth. He examined twenty-eight sources of growth, of both a quantitative and qualitative nature, and attempted to measure the contribution that each made to the growth of real national income. He found that as much as 12 percent of the total growth between 1909 and 1929, and as much as 23 percent of the economic growth of the United States between 1929 and 1957, could be attributed to education.<sup>19</sup> Denison was also one of the first to attempt

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<sup>18</sup>Ibid., pp. 300-01.

<sup>19</sup>Edward F. Denison, The Sources of Economic Growth in the U.S. and the Alternatives Before Us, Supplementary Paper No. 13 (New York: Committee for Economic Development, 1962).

to project the increase in national income that would result from a higher level of educational attainment by the labor force. He estimated that "all other things being equal, if the labor force in 1950 had been as well educated as that of 1960, . . . the national income would have been larger by 7.7 per cent."<sup>20</sup>

Kendrick, also using the residual approach, found somewhat higher figures. He found that 46 percent of the increase in total output of the United States economy over the period 1889 to 1957 could be ascribed to this residual.<sup>21</sup>

A significantly larger residual was found by Solow. In an article published in 1957, Solow assumed a linear, homogeneous production function, assumed the technical change to be neutral, and found the residual equal to 87.5 percent of the increase in output in the United States economy for the period 1915 to 1955.<sup>22</sup> In another article, Solow investigated the effects of technology, resource scarcity, capital investment, capital stock, and other factors upon economic growth, and concluded that between 1909 and 1929, 25 percent of the growth could be attributed to education alone.<sup>23</sup>

If education is to be considered a form of capital, a productive investment, there must be some return on this investment. Thus, at

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<sup>20</sup>Ibid., pp. 71-72.

<sup>21</sup>J. W. Kendrick, Productivity Trends in the United States (Princeton: National Bureau of Economics Research, 1961).

<sup>22</sup>Robert Solow, "Technical Change and the Aggregate Production Function," Review of Economics and Statistics, vol. 39, no. 3 (August 1957), pp. 312-20.

<sup>23</sup>\_\_\_\_\_, "Economic Growth and Residential Housing," in John D. Murgo, ed., Readings in the Economics of Education (New York: MSS Information Corp., 1972), pp. 114-41.

the same time that Schultz, Denison, and others were attempting to measure societal benefits of education by the use of the residual approach, others, namely Houthakker, Hansen, and Becker, were applying the returns to education approach to the measurement of these benefits. Although these researchers were primarily concerned with the measurement of the rate of return to the individual in terms of the incremental lifetime income and additional costs associated with a given educational investment, they also calculated rates of return to society for its additional investments in higher levels of educational attainment.

In doing this, on the basis of 1950 census data, Houthakker calculated the additional lifetime income, discounted by a number of discount rates, on a before tax and an after tax basis. The before tax income is sometimes referred to as "social returns," and the after tax income as "private returns."<sup>24</sup> Hansen referred to these calculations as the "total" and "private" rates of return to education in a similar study of rates of return which obtained quite similar results.<sup>25</sup> Hanoch's rates of return derived from a one in thousand sample of the 1960 census confirmed the estimates of Hansen.<sup>26</sup> Schultz also used the returns to education approach to calculate for several levels of education the expected rates of return on a total resource cost basis and on a private resource cost basis.<sup>27</sup>

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<sup>24</sup>H. S. Houthakker, "Education and Income," Review of Economics and Statistics, vol. 41, no. 1 (February 1959), pp. 24-28.

<sup>25</sup>W. Lee Hansen, "Total and Private Rates of Return to Investment in Schooling," Journal of Political Economy, vol. 71, no. 2 (April 1963), pp. 128-41.

<sup>26</sup>Hanoch, op. cit.

<sup>27</sup>Schultz, op. cit.



The most extensive work using the returns to education approach appeared in 1964 when Becker's Human Capital was published. Becker made detailed calculations of both the private and the social rates of return for investments in education. Society's investment was measured in terms of direct expenditures for current operating and capital outlay, plus indirect social costs in terms of gross earnings foregone by students. Society's gain was considered by Becker as being the direct taxes paid by individuals from the additional income associated with increased educational attainment.<sup>28</sup>

In the studies considered thus far, benefits were determined in terms of income differentials, rates of return, or calculations of economic growth. Other forms of economic externalities were not considered. A few studies have, however, attempted to measure these externalities. One of the first, and one of the most comprehensive, was that by Weisbrod. In addition to his classification of the various direct and indirect benefits to the individual that were discussed in the introduction, Weisbrod also classified the social externalities of education into residence-related benefits, employment-related benefits, and benefits to the rest of society; he also attempted to measure some of these.<sup>29</sup>

Residence-related benefits may accrue to the current family of the subject, the future family of the subject, neighbors, or taxpayers. An example that Weisbrod gave of a residence-related benefit to the current family was the child care service which schools provide working

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<sup>28</sup>Gary Becker, Human Capital (New York: National Bureau of Economic Research, 1964).

<sup>29</sup>Weisbrod, op. cit., p. 28.

mothers. Weisbrod contended that in 1956 there were 3.5 million working mothers in the United States with children six to eleven years of age. If the assumption is made that as few as one million of these mothers would not work except for the child care service provided by the schools, and that each of them made as little as \$2,000, the increased income resulting from this educational service would amount to \$2 billion per year.<sup>30</sup> Hirsch, Segelhorst, and Marcus, who began their original research in conjunction with Weisbrod, also examined and attempted to measure the child care benefit of education to working mothers.<sup>31</sup>

Benefits also accrue to the future family of the individual to be educated due to what are referred to as the intergeneration effects of education. The concept suggests that the educational attainment of individuals of one generation is related to that of the previous generation. Solomon stated the rationale as follows:

It has been argued that education, particularly of females who later became mothers, provides benefits to subsequent generations of children. There is evidence that children of more educated mothers become ultimately more successful than children of less-educated mothers, controlling for a large number of other factors. In a sense, this is a social return because the benefit is accruing to other than the person being educated.<sup>32</sup>

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<sup>30</sup>Ibid., pp. 28-9.

<sup>31</sup>Werner Z. Hirsch, Elbert W. Segelhorst, and Morton J. Marcus, Spillover of Public Education Costs and Benefits (Los Angeles: University of California, 1964) (ERIC ED 003 020).

<sup>32</sup>L. C. Solomon, Schooling and Subsequent Success: Influence of Ability, Background, and Formal Education, ACT Research Report No. 57 (Iowa City: The American College Testing Program, 1973), pp. 1-2 (ERIC ED 078 774).

Ribich found that two years of additional education to the parents resulted in 1.1 additional years of education per child.<sup>33</sup>

Since increased lifetime income is expected to accompany increased education, some measure of the economic effect of this induced inter-generational effect could theoretically be estimated. Swift and Weisbrod were the first to attempt such a measurement. They found that, in forty-two out of sixty cases considered, the potential return to the child was more than enough to cover the full cost of the parent's education, and still have a remainder sufficient to yield some positive rates of return to the child.<sup>34</sup>

The third type of residence-related benefits that Weisbrod suggested was the one that accrues to neighbors. "Education affects them at least in the following ways by inculcating acceptable social values and behavioral norms in the community children and by providing children with alternatives to unsupervised activities which may have antisocial consequences."<sup>35</sup>

Closely related to these benefits to neighbors is the fourth type of residence-related benefits, according to Weisbrod, the one to taxpayers who pay directly or indirectly for the consequences of the lack of education.

Inadequate education is associated with high unemployment and low income, and these are likely to encourage crime. It would be erroneous to attribute to inadequate education all of the differential unemployment and income of the poorly educated. It would be equally

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<sup>33</sup>Thomas I. Ribich, Education and Poverty (Washington: The Brookings Institute, 1968), pp. 101-07.

<sup>34</sup>William J. Swift and Burton A. Weisbrod, "On the Monetary Value of Education's Intergeneration Effects," Journal of Political Economy, vol. 73, no. 6 (December 1965), pp. 643-49.

<sup>35</sup>Weisbrod, op. cit., pp. 30-31.

erroneous to attribute all crime to low income . . . but . . . insofar as lack of education leads to employment difficulties and crime, law enforcement costs will tend to be high. Thus may education provide social benefits by reducing the need for incurring these "avoidance costs," to the advantage of taxpayers.<sup>36</sup>

In a case study of Clayton, Missouri, Weisbrod attempted to calculate the benefits to the taxpayers in the form of reduced unemployment compensation that resulted from the high level of educational attainment its populace enjoyed. In 1960, the median years of school completed by Clayton adults was 13.3 as compared with 10.6 for the United States. In the same year, the unemployment rate for Clayton residents was 0.7 percent compared to the rate for white persons in the United States of 4.7 percent. In terms of differences in average weeks unemployed this amounted to 1.8 weeks. At the average weekly Missouri unemployment compensation rate at the time of \$28.61 per week, this would amount to a present value of \$672,000 if as little as 50 percent of the 1960 Clayton student body of 2,067 students eventually spent an average of forty years in the labor force. Applying the same calculation to the differential unemployment rates between persons with no school and high school graduates, these external benefits would amount to \$465,000.<sup>37</sup>

Although Weisbrod mentioned the societal benefits resulting from reduced expenditures related to crime and law enforcement, he did not attempt to measure these benefits. However, in a case study in another locale, Spiegelman did make such an attempt. In a case study of youths aged 12 to 19 in Oakland, California, even when holding such factors as I.Q., race, and socioeconomic status constant, Spiegelman found a high

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<sup>36</sup>Ibid., p. 31, p. 80.

<sup>37</sup>Ibid., pp. 89-93.

correlation between being a high school dropout and being arrested for a juvenile crime. He calculated some of the costs of juvenile crime and delinquency in terms of costs to the victims of the crime and costs to society for protection, adjudication, detention, parole, etc. For his sample of youths involved in a Title I Elementary and Secondary Education Act program which was aimed at dropout prevention, the social value of reduced crime was estimated to be \$12 per Negro male and \$14 per non-Negro male.<sup>38</sup>

The second broad classification of social benefits discussed by Weisbrod was that termed employment-related. As mentioned in the introduction, the basic idea was that "where production involves the cooperative effort of workers, flexibility and adaptability of one worker will work to the advantage of others. Productivity of each member of the group influences the productivity of each other member."<sup>39</sup> Even though this benefit has definite economic consequences, Weisbrod made no attempt to measure it.

The final category of external benefits mentioned by Weisbrod was the one to society in general. He referred to such items as: the value of literacy in the transmission of information which is necessary for the functioning of the market economy and political democracy; the income redistribution effect of education; the training of persons in particular skills needed by society; or the impact of education in providing equality of opportunity.<sup>40</sup>

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<sup>38</sup>Robert R. Spiegelman, "A Benefit/Cost Model to Evaluate Educational Programs," Socio-Economic Planning Sciences (1968), pp. 443-60 as cited in Cohn, *op. cit.*, pp. 223-24.

<sup>39</sup>Weisbrod, *op. cit.*, p. 32.

<sup>40</sup>*Ibid.*, pp. 33-34.

In all, Weisbrod attempted to measure only three of the various externalities he discussed: those associated with unemployment expenditures discussed above; the additional income produced through education; and those gains resulting from taxes on the additional income. From calculations based on data from his case study of Clayton, Weisbrod found that a white male, age 18, may expect an additional \$14,500 in present value of adjusted lifetime income over someone with no formal schooling. Based on the rates of the average tax burden distribution nationally, this white male may be expected to pay additional federal taxes of \$1,300, and additional state and local taxes of \$1,600.<sup>41</sup>

In calculating increased lifetime income as a result of higher levels of educational attainment, and the foregone taxes from this increased income, Weisbrod based his calculations on the difference between no schooling and high school graduation. Improving on this all or nothing proposition, Levin, in the most comprehensive, quantitative treatment of economic externalities to date, calculated foregone national income and foregone tax revenues resulting from this income on the basis of the difference in the lifetime incomes of a cohort of males at their actual levels of educational attainment, compared to what it might be if all had a minimum of high school completion. Levin also estimated the annual expenditures for crime and welfare associated with inferior education.<sup>42</sup> A more detailed and critical examination of the Levin procedure will be the subject of Chapter II of this study.

The most recent treatment of the subject of externalities was that of Perlman. Perlman gave comprehensive treatment to the conceptual

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<sup>41</sup> Ibid., pp. 33-34.

<sup>42</sup> Levin, op. cit.

problems and policy issues involved in measuring educational costs and returns both to the individual and to society, but did not attempt to make any measurements of these. Nor did he introduce any additional economic externalities beyond those considered by Weisbrod. However, Perlman did point out many of the conceptual problems with which researchers are confronted when attempting to measure the economic returns of education.<sup>43</sup>

A review of the literature and research related to the proposed study showed that in the past two decades there have been a number of attempts by economists and educators to determine the economic importance of education to the society it serves. Initial attempts were by the use of the residual approach. The basic technique of this approach was to determine what part of the economic growth of the nation was attributable to education. Schultz and Denison were the primary researchers to use this approach.

Developing from the residual approach was the concept that education was a form of human capital. And, from the idea that education was a form of capital, invested in its holders, grew the returns to education approach that attempted to measure the returns on this investment. Hansen, Hanoch, and Becker were major contributors to this approach.

There have been only a few studies which have gone beyond the concepts included in these two approaches. The two major studies which have used a quantitative method are Weisbrod's and Levin's. The Weisbrod study measured increased income resulting from higher

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<sup>43</sup>Richard Perlman, The Economics of Education: Conceptual Problems and Policy Issues (New York: McGraw-Hill, Inc., 1973).

levels of educational attainment, the additional taxes that would accrue from this income, and the tax resources saved by society as a result of not having to pay as much unemployment compensation in a society that has a higher level of educational attainment. The Levin study measured foregone national income, foregone tax revenues resulting from lower levels of educational attainment, and expenditures for crime and welfare associated with inadequate education. The Perlman study treated some of the conceptual problems associated with the measurement of educational returns, and emphasized that authoritative opinion was not unanimous on the solution of these problems.

### Procedures

Procedurally, the study first critically described and examined Levin's procedure for measuring economic externalities. A step-by-step analysis of the Levin procedure was conducted, with the use of a review of related research to support or refute the validity of each point. Second, on the basis of the analysis of the Levin procedure, a revised model was developed. This model included procedures by Levin that seemed validated by the review of the related literature, and included revisions of the Levin procedure that seemed justified by the literature. Third, this revised model was applied to a sample of all males 25 to 29 included in 1972 census data. U.S. Government documents were used as the sources of data for educational attainment, income, tax receipts, welfare expenditures, crime-related expenditures, and educational costs.



### Organization of the Research Report

The proposed research will be reported in five chapters. Chapter I contains the statement of the problem, review of the related literature and research, and procedures. Chapter II includes a description and critical examination of Levin's procedure for measuring economic externalities of education. Chapter III proposes a model for measuring selected economic externalities based on the critical analysis of the Levin procedure. In Chapter IV, an illustrative application of the model to a select group of males age 24 to 29 is made. Chapter V summarizes the findings and discusses the model in view of its application.

## CHAPTER II

### REVIEW AND CRITIQUE OF THE LEVIN PROCEDURE FOR MEASURING THE ECONOMIC EXTERNALITIES OF EDUCATION\*

Over the past few years increasing concern has been expressed about the number of youths who do not complete high school relative to the number who graduate. The question of staying in or dropping out of school is related to the question of the contribution that education can make to the individual and to society. In response to this question, Levin prepared a report on request of the Select Committee on Equal Educational Opportunities of the United States Senate analyzing the costs to the nation, both economic and social, of inadequate education.

The procedure Levin used to measure the societal costs or externalities of inadequate education was entitled "reasoned estimation." The procedure is primarily concerned with the empirical measurement of social costs of inadequate education associated with foregone national income, foregone tax revenues for the support of government services, increases in the costs of income maintenance (unemployment compensation) and welfare programs, and increases in the costs related to crime. In addition, brief consideration was given to a discussion of the relationship between inadequate education

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\*Unless otherwise noted, all references and tabular materials in this chapter are to Henry M. Levin, The Effects of Dropping Out, A Report to the Select Committee on Equal Opportunity of the United States Senate (Washington, D.C.: U.S. Government Printing Office, 1972).

and reduced political participation, reduced intergenerational mobility, and poorer levels of health. Levin made no attempt to estimate any economic costs associated with these latter phenomena, thus this study did not review or attempt to attribute any economic costs to these items.

In estimating the social costs of foregone national income, foregone tax revenues, increased welfare expenditures, and increased costs of crime, Levin first made an analysis of the conceptual relationships between inadequate education and each of these phenomena. Second, these were translated into a set of empirical procedures for estimating related social costs. Third, a set of data was applied to this framework; and last, the resulting estimates were interpreted.

More specifically, in calculating the loss in national income and tax revenues attributable to inadequate education, Levin first reviewed the incidence of failure to complete high school among a cohort of young males who were theoretically old enough to have completed their education. Second, the actual distribution of educational attainment of this sample was compared with the hypothetical distribution of educational attainment that would have resulted under a policy of high school completion for this group of males. Third, the contribution to national income under the actual distribution was compared with the contribution to national income under the hypothetical distribution. The difference between the two was the foregone national income attributed to dropping out. Fourth, the loss in tax revenues to the local, state, and federal governments resulting from this foregone income was estimated. Fifth, the foregone national income, together with the lost tax revenues, was compared to the costs of providing this age group of males with a minimum of high school education.

TABLE 2

Educational Attainment for Males 25 to 34 Years of Age, March 1969, by Race  
[Numbers in thousands]

	Elementary		High School		College		Total
	Less than 8 Years	8 Years	1 to 3 Years	4 Years	1 Year	2 Years	
White Males	537	561	1,499	4,161	630	686	10,467
	5.1	5.3	14.3	39.8	6.0	6.5	100.0
Nonwhite Males	145	85	353	491	48	58	1,319
	10.9	6.4	26.7	37.2	3.6	4.4	100.0

### Incidence of Inadequate Education

Levin chose as his cohort of young men those 25 to 34 years old in the March 1969 census. He chose this group for two reasons: (1) they represented a group with recent educational experience who had generally completed their education and were beginning their work careers, and (2) there existed abundant census data for this group which would enable him to link their income with their education and other characteristics. In 1969 there were 11.8 million men in this age category, 10,467,000 white and 1,319,000 nonwhite. About 44 percent of the nonwhites had not completed high school as compared to 25 percent of the whites. The actual educational attainment of the sample used by Levin is given in Table 2.

This actual distribution of educational attainment is then compared to the hypothetical distribution of educational attainment under a public policy requiring a minimum of high school completion. Levin's hypothetical distribution is presented in Table 3.

TABLE 3

Hypothetical Distribution of Educational Attainment for  
Males 25 to 34 Years of Age, March 1969, by Race Under  
Minimum Requirements of High School Completion  
[Numbers in thousands]

	High School	College		
		1 to 3 Years	4 Years	5+ Years
White Males	5,919	2,020	1,414	1,155
Percentages	56.5	19.3	13.5	11.0
Nonwhite Males	866	210	121	105
Percentages	67.2	15.9	9.2	8.0

In calculating this hypothetical distribution, Levin assumed that if all those with actual levels of educational attainment below high school completion were to complete high school, the rates of continuation beyond high school would follow the pattern for nonwhite males 25 to 29 in the March 1969 census (see Appendix A). Levin said this was a conservative assumption for a group of high school graduates that is predominantly white since only about 19 percent of the nonwhites, as compared to 36 percent of the whites, had completed one or more years of college.

Additional data support the conservativeness of Levin's assumption. In reviewing the educational attainment of the total population in Table 4, it can be seen that the incidence of failure to complete a minimum of a high school education was much higher for nonwhites than for whites. Furthermore, this situation is not improving for nonwhites to any significant degree; the dropout rate for more recent high school students (ages 20-21 in 1972) was almost the same as that for earlier students (ages 25-29 in 1972). This same trend was noted by Schweitzer who, in considering the census data related to educational attainment for 1968, concluded that there was actually a decrease in the marginal rates of graduation between these two groups.<sup>1</sup>

On the basis of a comparison of the hypothetical distribution with the actual distribution, Levin estimated the number of additional males 25 to 34 years of age who might have completed their schooling at each level of education (high school and beyond) under a government policy requiring a minimum of high school graduation. Levin's data estimating the additional males at each level are presented in Table 5.

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<sup>1</sup>Stuart Schweitzer, "Occupational Choice, High School Graduation, and Investment in Human Capital," Journal of Human Resources, vol. 6, no. 3 (Summer 1971), pp. 322-23.

TABLE 4

Percentage of Male Population Completing No More Than Three  
Years of High School by Age (1972) and by Race

Age	20-21	25-29	29+
Total	17.4	19.5	41.7
White	14.9	17.8	36.9
Nonwhite	34.7	34.9	59.2

Source: U.S. Department of Commerce, Bureau of the Census, "Educational Attainment: March, 1972," Current Population Reports, series P-20, no. 243 (November 1972), Table 1.

TABLE 5

Estimated Numbers of Additional Males 25 to 34 Years  
of Age Completing Education at Each Level Under  
Public Policy of High School Completion

	High School Completion	College		
		1 to 3 Years	4 Years	5+ Years
White Males	1,758,000	418,000	223,000	195,000
Nonwhite Males	395,000	94,000	50,000	44,000

#### Estimates of Foregone National Income

Before calculating the foregone national income associated with the inadequate education of his cohort, Levin addressed a number of

conceptual and empirical issues. The first question Levin explored was the relationship between schooling, productivity, and income. Levin noted several reasons that are often posited for school-related productivity of persons. The first is that additional schooling provides one with a greater set of skills, both specific vocational skills and general numerical and language skills which improve productivity. Second, it has been suggested that, in a society characterized by rapid technological change, education contributes to productivity by creating greater adaptability to change. These two reasons noted by Levin are basically the same as those employment-related benefits of education referred to by Weisbrod and Davis in Chapter I. A third justification that Levin cited linking productivity and schooling is that since schools tend to be organized much like other organizational units with high degrees of internal specialization and similar infrastructures, additional schooling tends to inculcate persons with specific attitudes and behaviors that help them to function in the large bureaucratic organizations that characterize both the private and the public sector. Levin cited Gintis as having developed substantial evidence supporting this thesis.<sup>2</sup> In spite of what seemed to be sufficient justification, Levin concluded that the conceptual knowledge linking productivity and schooling is not easily verified quantitatively and that the studies which have attempted to explore the link have been anecdotal or fragmentary at best.

A review of the literature indicated that this conclusion is justifiable. For example, Perlman, discussing the effect of education on

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<sup>2</sup>Herbert Gintis, "Education, Technology and the Characteristics of Worker Productivity," American Economic Review, vol. 61, no. 2 (May 1971), pp. 266-79.



work-force productivity, while making such positive statements as, "the high returns of the educated to a large degree reflect their increased productivity resulting from schooling," and "an educated worker can . . . improve production techniques, modify office procedures, and in many ways raise efficiency of other workers," also admitted to the complications and uncertainties that arise when making quantitative assessments of the education-earnings-productivity link.<sup>3</sup> Griliches, who has done extensive research on education as a variable in production function equations, also confirmed the conclusion reached by Levin when he remarked: "After all, the measures I have presented are not much more than accounting conventions. Evidence (in some causal sense) has yet to be presented that 'education' explains productivity differentials."<sup>4</sup>

The second conceptual problem to which Levin addressed himself was the justification of the use of present income differentials and their stability over time. As Levin noted, generally, the application of the economic theory of supply and demand would suggest that as the supply of high school graduates, vis a vis ones with less than a high school education, increases, the income of the graduates will decline. If this were to hold true in Levin's procedure, the 1969 observed differences in incomes between the actual levels of schooling would be overstating the differences in incomes between the two levels under a public policy of a minimum of high school completion. However, evidence suggested exactly the opposite has taken place in education. That is, as the supply of high school graduates has increased, the income of high

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<sup>3</sup>Perlman, op. cit., pp. 34-5, 87-109.

<sup>4</sup>Zvi Griliches, "Notes on the Role of Education in Production Functions and Growth Accounting," in W. Lee Hansen, ed., Education, Income and Human Capital (New York: National Bureau of Economic Research, 1970), p. 80.

school graduates relative to elementary graduates or high school dropouts has also increased. Levin, citing Bowles and Johnson,<sup>5</sup> found that in 1949, male high school graduates were receiving about 134 percent of the income of male elementary graduates, and by 1966 the differential had risen to 156 percent despite the large increase in the number of persons with high school diplomas. Harris noted this same trend in income differentials between high school graduates and college graduates from 1949 to 1956 despite the large influx of new college graduates.<sup>6</sup> Morgan and Lininger also observed that "the recent data show a larger differential than appeared five years earlier in the annual earning of spending unit heads with more education as compared with those with less education."<sup>7</sup> Thus, as Levin claimed, the literature seems to suggest that it is unlikely over the long run that the present relative income differences between high school graduates and those with less than high school completion will decline as the number increases. Therefore, the use of the present income differentials appeared to be justified.

The third major conceptual issue Levin considered was the question of an ability adjustment. Most authorities realize that additional income of the educated should not only be associated with the greater degree of education, but also that a number of factors such as ability;

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<sup>5</sup>Samuel S. Bowles, "Aggregation of Labor Inputs in the Economics of Growth and Planning: Experiments With a Two-Level CES Function," Journal of Political Economy, vol. 78, no. 1 (January/February 1970) and George E. Johnson, "The Demand for Labor by Educational Category," Southern Economic Journal, vol. 37, no. 2 (October 1970), pp. 190-207.

<sup>6</sup>Seymour E. Harris, "General Problems in Education and Manpower," in Seymour E. Harris, ed., Economic Aspects of Higher Education (Paris: Organization of Economic Co-Operation and Development, 1964), pp. 49-50.

<sup>7</sup>James Morgan and Charles Lininger, "Education and Income: Comment," Quarterly Journal of Economics, vol. 78, no. 2 (May 1964), p. 346.

I.Q.; high school rank; parental income, occupation, and education; and socioeconomic status affect expected lifetime earnings. Thus, they have, in their calculations of the effect of education on income differentials, tried in various ways to make an allowance for these factors. This allowance is generally known as the ability adjustment. Levin stated that the findings of the studies which have attempted to pursue the ability-education relationship have been far from uniform. Some studies have found no effect of ability on income, while others have found the effect was enough to reduce the apparent relationship between education and income by one-third. Levin noted a comparison of the findings of Griliches with Taubman and Wales as exemplifying this point.<sup>8</sup> Given the variation among the studies, Levin concluded that it was not possible to know the exact proportion of income differentials among persons at the various educational levels that is attributable to differences, but that a 25 percent correction for ability was within the proper range of ability effects implied by studies that have examined the ability-education-income nexus. Thus, in his procedure, Levin deflated income differences associated with schooling by 25 percent to account for the higher abilities of persons who have attained more schooling.

A review of the literature related to ability adjustments indicated that Levin's 25 percent correction was below the percentage most authorities use as the proper adjustment figure. In her review of the research, Woodhall found that:

most of the American estimates of the rate of return to education . . . take two-thirds of

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<sup>8</sup>Griliches, op. cit. and Paul Taubman and Terence J. Wales, "Untitled Manuscript" (Department of Economics, University of Pennsylvania, 1970), mimeo.

the earning differentials associated with education as a measure of the direct returns to education . . . and most of the British studies follow the American example and reduce the earnings differentials by one-third to allow for the effects of ability and other factors on earnings.<sup>9</sup>

In another writing she specifically stated: "the estimate of 0.66 is probably reasonable for the United States."<sup>10</sup>

Weisbrod, in his measurements of the economic externalities mentioned in Chapter I, reduced census data relative to income by 40 percent to adjust for nonschooling factors.<sup>11</sup> Morgan and David also found 40 percent to be the percentage necessary to adjust for factors other than age and education in the earnings differentials between high school and college graduates age 18 to 34.<sup>12</sup> Denison, in his original work on the contribution of education, Sources of Economic Growth, calculated the contribution at 50 percent, 60 percent, and 67 percent, and then assumed 60 percent as the appropriate adjustment for education.<sup>13</sup> Since this study Denison has produced data that substantiate the use of a 60 percent correction factor.<sup>14</sup>

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<sup>9</sup>Woodhall, op. cit., pp. 36-38.

<sup>10</sup>Maureen Woodhall, Cost-Benefit Analysis in Educational Planning Fundamentals of Educational Planning, No. 13 (Paris: International Institute for Educational Planning, 1970), p. 28.

<sup>11</sup>Weisbrod, op. cit., pp. 45-46.

<sup>12</sup>J. N. Morgan and M. H. David, "Education and Income," Quarterly Journal of Economics, vol. 77, no. 3 (August 1963), pp. 436-37.

<sup>13</sup>Denison, op. cit., p. 69.

<sup>14</sup>Edward F. Denison, "Measuring the Contribution of Education to Economic Growth," in E. A. G. Robinson and John E. Vaizey, eds., The Economics of Education (London: Macmillan, 1966), p. 207.

Levin also justified the use of a 25 percent correction factor on the basis that:

ability seems to be a more prominent factor in explaining income differences at relatively high levels of educational attainment than at lower ones (e.g. college level). In this respect our estimates of foregone national income due to undereducation of a particular segment of the population are derived primarily from comparing income differences for persons at the lower ends of the educational spectrum where "ability effects" are likely to be less prominent.<sup>15</sup>

This justification was not supported by a review of the literature on the topic. The most important conclusion of the Becker study was that although a considerable correction for ability is called for in calculating income differentials between high school and elementary graduates, only minor corrections are required in calculating differentials between college income and high school graduates' income.<sup>16</sup> Griliches, in developing a mathematical model to explain the income-education-ability issue stated that the data supported "the greater role of 'ability' at the lower end of the educational distribution as found by Hansen, Weisbrod, and Scanlow."<sup>17</sup> Ashenfetler and Mooney found that among a group of Woodrow Wilson Fellowship holders, ability had only a marginal effect on income differentials among those at different levels of graduate school completion.<sup>18</sup>

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<sup>15</sup>Levin, op. cit., p. 21.

<sup>16</sup>Becker, op. cit., pp. 79-88.

<sup>17</sup>Griliches, op. cit., p. 96.

<sup>18</sup>Orley Ashenfetler and Joseph Mooney, "Graduate Education, Ability, and Earnings," Review of Economics and Statistics, vol. 50, no. 1 (February 1968), pp. 78-86.

A fourth issue to which Levin addressed himself before calculating foregone income and foregone tax revenues pertained to the relative values of future versus present income. That is, if investment in education is considered to be an investment not fundamentally different from other investments, then the investment decision would be based upon devaluing income obtained in the future in comparison with that obtained in the present. The underlying assumption is that a given amount of income received in the present yields more satisfaction than the same amount deferred until the future. This assumption is usually handled by using some interest rate to discount future income streams to reflect the fact that future income has less value than the same amount of income derived in the present. This allows decisionmakers to compare income benefits of alternative investments on the basis of their present value.

As Levin suggested, the selection of the optimal discount rate for an investment depends upon the nature of the investment and is subject to controversy. Cohn elaborated on this point as follows:

the *social* rate (to be applied to public projects) may differ significantly from the *private* ones . . . a choice of a very low rate of discount is likely to favor the selection of projects whose net benefit stream extends far into the future. The choice of a high discount rate, on the other hand, is likely to favor short-run projects.

Since society--unlike any one of its component individuals--has an interest in *future* as well as present generations, it seems that the social rate of discount should be substantially lower than the private rate. Yet a selection of a low discount rate could result in the selection of projects that do not maximize the present value of expected income (net). So it is not a simple matter to determine the exact rate of discount applicable in each case.

Some authors prefer the rate of return on "safe," long-term, federal bonds for use in public projects. Others contend that we must use the marginal rate of return on the next best alternative investment . . . the only consensus in this controversy is that there is a lack of consensus.<sup>19</sup>

Bowen had a similar contention when he stated that: "there is no simple answer to the question of what is the right discount factor, and this question has in fact been the subject of considerable debate."<sup>20</sup>

In choosing the optimal discount rate for the foregone income of his sample, Levin said two criteria were considered: the specific implications of improving the educational attainment of would-be drop-outs, and the estimations of lifetime income based on present income levels unadjusted for future increases in productivity. The point in the first criterion is related to the intergenerational effects of education noted in Chapter I. That is, an investment in raising the educational attainment of an educationally neglected segment of the population not only would increase national income and reduce the disparity in opportunities within the existing society, but also, as a result of the intergenerational effect, this improvement in opportunity would be transmitted to future offspring thus obviating much of the necessity for similar investments in their education. Thus, said Levin, the nature of this investment is such that it seems reasonable to minimize the penalty attached to future income, i.e., use a low discount rate, particularly if no short run alternative to improving equality exists.

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<sup>19</sup>Cohn, op. cit., p. 176.

<sup>20</sup>Bowen, op. cit., p. 33.

Levin's second justification for the use of a low discount rate was that the estimates of lifetime income by level of educational attainment that he used in his study were based upon present incomes that did not account for future increases in productivity. As Levin noted, based upon the experience of the 1960s, a 3 percent increase in labor productivity can be expected over the long run. Thus, by not adjusting future income upward for increases in productivity, he indicated that he was tacitly assuming a discount rate of about 3 percent. In fact, however, the use of 1969 census data related to lifetime income at a 0 discount rate with an annual productivity increase of 0 percent, which is what Levin used, does not yield the same results as the use of a 3 percent discount rate with an annual productivity increase of 3 percent, which is what he said he was tacitly assuming. For example, the lifetime income of males with five or more years of college at a 0 percent discount rate with an annual productivity increase of 0 percent is \$544,000. However, in comparison, at a discount rate of 3 percent with an annual productivity increase of 3 percent, the lifetime income for this same group would be \$536,000.<sup>21</sup>

In addition to the above disparity, a review of the literature revealed that his choice of a discount rate was somewhat too conservative. For example, Shaffer said that 8 percent was "not an unreasonable rate of discount if one considers the risk involved in 'investing' in a college education."<sup>22</sup> And, in discussing the discount rate problem

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<sup>21</sup>U.S. Department of Commerce, Bureau of the Census, Current Population Reports, series P-60, no. 74, Table 10.

<sup>22</sup>H. G. Shaffer, "A Critique of the Concept of Human Capital," in M. Blaug, ed., Economics of Education 1 (Baltimore: Penguin Books, Inc., 1968), p. 49.



over a decade ago (1963) Bowen said:

Some authors have used 4 percent as the discount factor (or the other rate of return) on the ground that this is roughly the long-term rate of interest and represents the costs that the government itself must occur in borrowing money. To the extent that one is prepared to assume that in fact it is going to be the government that will be providing any additional funds for education, there is much to be said for using a figure of this kind.

However, if we assume that individual students (or their families) are the ones contemplating investing in education, then a higher rate is surely appropriate, partly to take account of the greater risk involved in financing a single (typical) individual than in financing a large group. An individual would find it simply impossible to borrow educational funds on the private market at anything like 4 percent interest.<sup>23</sup>

A study of the literature by Hirsch, Segelhorst, and Marcus concluded that "mainly three different discount rates have been proposed, i.e., 3 1/2, 5, and 10 percent," and, although all three rates were used in their study, major emphasis was placed on the 5 percent figure.<sup>24</sup>

When judged by either of the two methods referred to by Cohn,<sup>25</sup> the rate of return on "safe," long-term, federal bonds or the marginal interest rate of return on the next best alternative investment, the choice of the 3 percent discount rate by Levin would be too low. The rate of return on "safe," long-term, federal bonds is certainly more than 3 percent. Friedman considered a 5 percent rate to be "quite acceptable at the present time as a 'riskless' interest rate consonant

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<sup>23</sup>Bowen, op. cit., pp. 33-34.

<sup>24</sup>Hirsch, Segelhorst, and Marcus, op. cit., p. 303.

<sup>25</sup>Cohn, op. cit.

with generally available investment opportunities."<sup>26</sup> The marginal internal rate of return on the next best alternative investment would be even higher. For example, Becker used a comparative rate of return of about 9 to 10 percent on the basis that this was roughly the average rate of return on private investment in the United States.<sup>27</sup> However, the appropriateness of this high a discount rate for the purposes of a government policy, such as that proposed in the Levin study, i.e., investment in raising the level of educational attainment of a segment of the population, is questionable on the grounds that:

the actual alternative investment opportunities open to the government may not be nearly so lucrative. (In the U.S. economy at any rate, there is a strong presumption that public funds will not be invested in such commercially profitable fields as chemicals, applied electronics, soft drink production, and the like but rather, in such activities as running the post office and supporting agricultural prices, as well as in research and development . . . .)<sup>28</sup>

In light of the controversy surrounding the choice of a discount rate, many authors propose that a sensitivity analysis be carried out for each proposed investment. That is, instead of calculating the present value for only one discount rate, the present value should be calculated for several different rates. In some cases, the choice between alternative investments would not vary at all with changes in the discount rates. In others, particularly when one investment is

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<sup>26</sup>Clara H. Friedman, "Education of New York City Public School Teachers," in Daniel C. Rogers and Hirsch S. Ruchlin, Economics and Education: Principles and Applications (New York: The Free Press, 1971), p. 193.

<sup>27</sup>Gary Becker, "Underinvestment in College Education?" American Economic Review, vol. 50, no. 2 (May 1960), pp. 348-49.

<sup>28</sup>Bowen, op. cit., p. 34.

long-lived and another is of shorter duration, changes in the discount rate would change the attractiveness of one investment with respect to its alternatives.<sup>29</sup> Houthakker used this procedure in calculations based on 0, 3, 6, and 8 percent discount rates.<sup>30</sup> Hansen, also using 1950 census data, used these four discount rates plus a discount rate of 10 percent in making his calculations.<sup>31</sup> Weisbrod, whose calculations of foregone income and tax revenues were most similar to those of Levin, presented his results on the basis of both a 5 percent and a 10 percent discount rate.<sup>32</sup>

A final conceptual consideration introduced by Levin was to account for racial differences in income. Levin's calculations relative to foregone income are based upon lifetime income by level of educational attainment. These data, as available from census sources, were reported without regard for race. However, the evidence indicates that differences do exist in the average incomes of whites and nonwhites at the same level of education. On the basis of 1960 census data, Welch observed that: "a non-white with no schooling will receive 81 percent of the income of a similar white. Yet for non-whites, school attendance increases income at a rate which is only 28 percent of the corresponding increases for whites."<sup>33</sup> Hanoch, using the same data remarked that "internal rates of return for non-whites are generally low and relatively

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<sup>29</sup>Cohn, op. cit., p. 176.

<sup>30</sup>Houthakker, op. cit.

<sup>31</sup>Hansen, op. cit.

<sup>32</sup>Weisbrod, op. cit.

<sup>33</sup>Finis Welch, "Labor Market Discriminations: An Interpretation of Income Differences in the Rural South," Journal of Political Economy, vol. 75, no. 3 (June 1967), p. 235.

erratic."<sup>34</sup> Weiss, on the basis of data obtained from the 1/1000 sample of the 1960 census for the North Central Region, found that for nonwhites the income increment associated with an additional year of school was only one-fourth as large as the corresponding figure for whites.<sup>35</sup>

However, these findings, some of which were noted by Levin, were based upon observations around 1960 at which time the majority of the black adult population would have been in school in the decades of the 1920s and 1930s. During this time blacks generally attended segregated and inferior schools. Research based upon more recent data, however, indicated that these income differentials between races were rapidly decreasing. Welch, writing in 1973, on the basis of 1966 Survey of Economic Opportunity data, concluded that returns to education for blacks schooled in the 1950s and 1960s exceeded returns to whites.<sup>36</sup> His estimates "imply that income gains that were earlier realized by whites as average educational levels increased are now being realized by blacks."<sup>37</sup>

Levin presented 1969 census data (Table 6) which indicated that at least for Negro and white males 25 to 54 these income differentials were still a factor. A comparison of the Negro income as a percent of white income by years of school completed for the age group 25 to 34 (Table 7), which would correspond to the age group of the sample being

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<sup>34</sup>Hanoch, op. cit., p. 325.

<sup>35</sup>Weiss, op. cit., pp. 154-55.

<sup>36</sup>Finis Welch, "Black-White Differences in Return to Schooling," American Economic Review, vol. 63, no. 5 (December 1973), pp. 893-907.

<sup>37</sup>Ibid., p. 896.

studied and which approximates the group researched by Welch, indicated that, while indeed the situation relative to income differentials had improved, it was still far from attaining the situation described by Welch.

TABLE 6

Median Income for Negro and White Men 25 to 54 Years  
Old in 1969 by Highest Grade Completed

Years of School Completed	Median Income		Nonwhite Income as Percent of White
	Nonwhite	White	
Elementary:			
8 Years or Less	\$3,922	\$5,509	71
8 Years	4,472	7,018	64
High School:			
1 to 3 Years	5,327	7,812	68
4 years	6,192	8,829	70
College:			
1 to 3 Years	7,427	9,831	76
4 Years or More	8,669	12,354	70

Given the existing income differentials between nonwhites and whites, Levin determined that lifetime incomes, which as stated previously were reported by level of educational attainment without regard for race, must be calculated and reported separately for whites and nonwhites. To do this required data relative not only to nonwhite income as a percent of white income, but also to the proportion of nonwhite males at each level of educational attainment. This information would not be necessary if nonwhites represented the same proportion

TABLE 7

Median Income for Negro and White Men 24 to 34 Years  
Old in 1970 by Highest Grade Completed

Years of School Completed	Median Income		Nonwhite Income as Percent of White
	Nonwhite	White	
Elementary: 8 Years or Less	\$4,743	\$6,618	72
High School: 1 to 3 Years	5,749	7,910	73
4 Years	6,789	8,613	79
College: 1 to 3 Years	7,699	9,190	84
4 Years	8,715	11,212	78
5 Years or More	9,955	11,808	84

Source: U.S. Department of Commerce, Bureau of the Census, "The Social and Economic Status of the Black Population in the U.S., 1972," Special Studies, Current Population Reports, series P-23, no. 46, p. 25.

of the population at each education level. However, when the Levin data are presented (Table 8), the proportion of nonwhite males decreased as the level of educational attainment increased. As Levin indicated, this suggests that a portion of the higher income of males in the general population that was associated with additional education was also attributable to the smaller concentrations of nonwhites at the higher educational levels.

The results of Levin's calculations of separate lifetime incomes for whites and nonwhites are presented in Table 9.

TABLE 8

Nonwhite Males as Proportion of All Males  
25 to 34 Years Old

Educational Attainment	Nonwhite      White		Nonwhite as Percent of Total
	(thousands)		
Less Than 8 Years	145	337	21.3
8 Years	85	561	13.2
9 to 11 Years	353	1,499	19.1
12 Years	491	4,161	10.6
13 to 15 Years	116	1,602	7.2
16 Years	71	1,191	5.6
17 or More Years	61	960	6.0

TABLE 9

Estimated Lifetime Incomes From Age 18 for Males by  
Race and Educational Attainment

Level of Schooling Completed	Lifetime Income		
	All Males	White	Nonwhite
Elementary:			
Less Than 8 Years	\$206,000	\$219,500	\$155,900
8 Years	263,000	276,100	176,700
High School:			
1 to 3 Years	282,000	300,400	204,200
4 Years	336,000	347,000	242,900
College:			
1 to 3 Years	378,000	384,000	292,300
4 Years	489,000	497,500	348,200
5 Years or More	544,000	554,000	387,800

The data presented in the first column for lifetime income for all males in the three categories of less than four years high school were not the actual census data but were increased by Levin to include the income to be received before age 18 by those individuals who had not completed high school. Thus, he arbitrarily added four years of income to the expected lifetime income of those with less than eight years of schooling and two years income for those with one to three years high school. Also, the income data presented in Table 9 were not from age 18 to death as might be suggested by the title Levin gave this table, but were actually only lifetime income from age 18 to age 64 according to the census data.<sup>38</sup>

Having dealt with the aforementioned conceptual issues, Levin then calculated the income that the nation had lost by having failed to educate to a minimum of high school completion all men in the 25 to 34 year old group of the 1969 census. This was done by applying the lifetime incomes by educational level for white and nonwhite males, presented in Table 9, to the additional educational attainments of the 25 to 34 year old group of males assuming that all of these men had completed a minimum of high school, and then deflating this gross figure by 25 percent to account for nonschooling or ability factors. Levin's results are depicted in Table 10.

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<sup>38</sup>U.S. Department of Commerce, Bureau of the Census, Current Population Reports, series P-60, no. 74, Table 10.



TABLE 10

Estimates of Incomes Foregone by Failure to Invest in  
a Minimum of High School Completion for All  
Males 25 to 34 Years Old  
[Numbers in billions]

	Gross Income Foregone	After 25 Percent Ability Adjustment
White:		
High School Completion	\$178	\$133.5
College	90	67.5
Total Whites	268	201.0
Nonwhite:		
High School Completion	32	24.0
College	16	12.0
Total Nonwhites	48	36.0
Total All Males 25-34 Years Old	316	237.0

### Loss in Tax Revenues

Inherent in the loss of \$237 billion in national income is a reduction of tax revenues at all levels of government. In 1969, government tax receipts represented about 31 percent of personal income. As shown in Table 11, about two-thirds of these public revenues went to the federal government and about one-third to state and local governments.

TABLE 11

Federal and State-Local Tax Revenues as Proportion  
of Personal Income, 1969  
[Totals in Millions of Dollars]

Type of Tax	Federal	State-Local
Personal	\$95,822	\$13,876
Corporate Profits	39,169	3,483
Indirect Business	17,996	63,935
Total	152,987	81,294
Personal Income	748,874	

Note: Federal taxes/personal income--20.4 percent. State-local taxes/personal income--10.9 percent. Total taxes/personal income--31.3 percent.

By applying the above calculated percentages to the \$237 billion, the income lost to the nation as a result of the inadequate education of the group of 25 to 34 year old males, Levin found approximately \$71 billion in additional tax revenues that also had been lost to the nation. Of this foregone tax revenue, about \$24 billion would have been realized to the state and local governments, and about \$47 billion to the federal government.

#### The Cost of Providing Adequate Education

To this point in his procedure, Levin had estimated the social costs of failing to provide adequate education for his cohort in terms of foregone national income and foregone government revenues. These

costs would become benefits to the nation if they were to be realized. Levin next compared these costs/benefits with the cost of providing the same individuals with a minimum of a high school education, as well as the additional costs that would accrue as a result of a greater number of high school graduates continuing on to college.

The costs of education are of two main types. First, there are the direct costs. These may be incurred by the individual recipient of the education or his family for items such as tuition, books, or supplies. Direct costs may also be incurred by society in the form of direct expenditures for current expenditures such as salaries, supplies, and maintenance, as well as capital outlay. Second, there are the indirect or opportunity costs. These take the form of foregone student income, foregone tax revenues on the foregone income, foregone tax revenues because of real estate tax exemptions, and the imputed costs of depreciation and interest. Of these indirect costs, foregone student income is by far the largest component. Of the two types of costs, direct and indirect, Cohn said that:

Direct costs have received by far the bulk of attention, perhaps because the consequences of such costs are directly and strongly felt by the taxpayer--and, of course, because statistics on direct school outlays are readily available (or estimable), whereas indirect costs must be imputed.<sup>39</sup>

When indirect costs, primarily earnings foregone, are included in the measurement of educational costs, they tend to make up a large share of the total educational costs. For example, when considered, foregone income has been estimated to account for over two-fifths of

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<sup>39</sup>Cohn, op. cit., p. 78.

the total costs of education.<sup>40</sup> However, a number of researchers, because of foregone income's very magnitude, feel that it is necessary to include it in their measurements of educational costs. Schultz stated: "This component should be included and it is far from negligible. In the United States, for example, well over half of the costs of higher education consists of income foregone by students."<sup>41</sup> Cohn said that: "ignoring opportunity costs will definitely create a serious downward bias in the estimates of educational costs."<sup>42</sup> Blaug's arguments, as summarized by Woodhall, were even more strongly in favor of the inclusion of foregone income:

Blaug argues that earnings foregone should be included in any estimate of the true economic cost of education, particularly if the purpose is to analyse education as an investment. His grounds for including earnings foregone are threefold: (i) it helps to explain why the drop-out rate after the minimum school leaving age is everywhere inversely related to the income of the households--'families with low incomes cannot easily afford to forgo the earnings of their children'; (ii) if foregone earnings are ignored there is a tendency to treat education after the age of 15 or 16 as 'free' which is a 'potent source of irrational planning' and leads to a gross misuse of student time within educational systems; and (iii) perhaps a massive understatement of investment in education in national income accounts.<sup>43</sup>

In spite of these arguments, Levin did not consider opportunity costs as a cost of education in his measurements of educational costs.

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<sup>40</sup>T. W. Schultz, "Investment in Human Capital," in Blaug, ed., op. cit., p. 25.

<sup>41</sup>Ibid.

<sup>42</sup>Cohn, op. cit., p. 100.

<sup>43</sup>Woodhall, op. cit., pp. 24-25.

A review of additional literature supported his failure to do so. The major criticism of the inclusion of foregone income came from Vaizey. His reasons were several. First, the law prevents young people from working before a certain age in most instances. Second, the inclusion of foregone income opens the gate to a flood of approximations which would take the concept of national income away from its origin as an estimation of the measureable flow of the economy. If foregone income is added to the cost of education when calculating national income, it must also be added to other sectors of the economy such as housewives or voluntary workers.<sup>44</sup> Weisbrod has stated:

The increased production from working mothers tends to offset the foregone production from students in school. Various writers have emphasized student's foregone earnings as a cost of education, and have debated its magnitude, but have not considered the fact that some mothers' earnings are made possible by the fact that children forego earnings to remain in school.<sup>45</sup>

Further, Balogh and Streeten have stated:

they pay a good deal of attention to 'income foregone during study' which constitutes a large portion of the costs of 'investment.' But neither the income foregone by other groups in society (housewives, voluntary workers, people such as some university teachers--accepting a lower income than they could get in other occupations), nor the non-financial benefits enjoyed during education are estimated.<sup>46</sup>

Both statements support Vaizey's position on this point. Vaizey's third objection to the inclusion of foregone income was that this

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<sup>44</sup> John Vaizey, The Economics of Education (London: Faber and Faber, 1962), p. 43.

<sup>45</sup> Weisbrod, op. cit., p. 29.

<sup>46</sup> T. Balogh and P. P. Streeten, "The Planning of Education in Poor Countries," in Blaug, ed., op. cit., p. 387.

inclusion would make it necessary to adjust these costs by some estimates of the benefits received while being educated.<sup>47</sup> In recent writings Vaizey has reiterated his objections to the inclusion of foregone incomes and his views have received some endorsement.<sup>48</sup>

The decision of whether or not to include a measurement of foregone income is also related to the nature of the particular research. A review of the literature indicated that the nature of the research undertaken in the Levin study was such as to make the inclusion of foregone income inappropriate. Woodhall contended that:

It may make sense to argue that the alternative use of one student's time can be measured by his earnings foregone, but not if one is 'concerned with the costs of educating a complete age group, where the alternative would involve radical changes in the labour market' . . . Whether or not it is appropriate to include earnings foregone as an indirect cost of education clearly depends on the nature of the calculations or research . . . the argument that it may be appropriate to include earnings foregone when measuring a marginal change in resource allocation, but not when considering a radical change, or when calculating the real cost of the educational system seems convincing.<sup>49</sup>

Burkhead expressed a similar concern for the inclusion of foregone income when dealing with large aggregates. His position was that:

The inclusion of foregone income in educational costs is quite appropriate for an individual who wishes to calculate his own net return from an investment in education, but it is much more questionable in application to estimates of the full cost to society of investment in education for a nation. It is possible to imagine that several thousands of students now in college

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<sup>47</sup>Vaizey, op. cit.

<sup>48</sup>M. Blaug, "The Rate of Return on Investment in Education," in Blaug, ed., op. cit., p. 235.

<sup>49</sup>Woodhall, op. cit., p. 26.

could find alternative employment, although job opportunities have recently been limited for this age group. But it is difficult to imagine that several million high school and college students could find employment without a reordering of the work force, and indeed, of the whole economy, to lower skill levels. Marginal comparisons and opportunity cost concepts have no meaning applied to greatly different kinds of economic organizations.<sup>50</sup>

As Burkhead expressed, concern exists as to what would happen to unemployment and wage rates if large numbers of students were dumped on the market. Even without this situation, dealing only with the present high unemployment rates, the question can be asked if one is justified in assuming, with substantial amounts of unemployment among the young, that the student at school or college has the alternative of a job.<sup>51</sup> Thus:

Although imputation of foregone student earnings appears reasonable for a small school district in a world of full employment, such imputation may appear unreasonable when applied to the economy as a whole if job opportunities are not available for high school dropouts.<sup>52</sup>

Levin used two methods for assessing the investment costs of raising educational attainments, each being based on a different assumption and having different implications for estimating the magnitude of such costs. Levin applied both methods to the measurement of investment costs and selected the midpoint of the range as representing the most reasonable figure. The first method assumed that by maintaining present expenditure levels, but changing their focus, schools would be able to increase their retention rate. The second method assumed that

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<sup>50</sup>Burkhead, op. cit., p. 5.

<sup>51</sup>Harris, op. cit., p. 13.

<sup>52</sup>Hirsch, Segelhorst, and Marcus, op. cit., p. 446.

it would take great increases in expenditures to meet the needs of these potential dropouts and keep them in school. The first method represented the lower limit of Levin's estimated cost of providing higher educational attainment for his cohort. The second method represented the upper limit.

TABLE 12

Estimates of Investment Costs for Providing a Minimum of  
High School Completion and Nonwhite Continuation Rates  
Beyond High School for All Males in 25 to 34  
Year Age Group

	Number of Additional Persons Completing Level (thousands)	Number of Years Additional Schooling Per Person	Cost Per Year	Total Cost Per Level (billions)
From Elementary to High School Completion:				
Less Than 8 Years	682	7	\$1,214	\$5.796
8 Years	646	4	1,214	3.137
1 to 3 Years	1,852	2	1,214	4.497
Total				13.430
From High School Com- pletion to:				
1 to 3 Years College	512	2	2,545	2.606
4 Years College	273	4	2,545	2.779
5 or More Years College	239	6	2,545	3.650
Total Costs, College				9.035
Total Investment Costs for High School Completion and College Attendance				22.475



Levin's estimate of the lower limit of investment costs is presented in Table 12. The estimate included not only the costs of high school completion but also college costs for the portion of the additional graduates who would continue their education beyond high school. Costs were based on U.S. Office of Education data which report current expenditure per pupil in average daily membership (ADM) for all elementary and secondary pupils. Levin assumed expenditures at the elementary level to be only about 60 percent of those at the secondary level. This estimate was too low according to National Educational Finance Project data, which suggested that elementary expenditures were 80 percent of secondary expenditures.<sup>53</sup> Levin also applied the 60 percent differential to per pupil capital outlay expenditures even though elementary capital outlay has been estimated to represent only 66 percent of secondary capital outlay costs.<sup>54</sup> U.S. Office of Education fall 1970 data for capital outlay costs of \$5.1 billion were used to calculate a capital outlay per secondary pupil of \$149. Adding this to the calculated \$1,065 per secondary pupil current operating expenditure gave a total annual expenditure of \$1,214 for secondary students. Also, in Table 12 Levin multiplied the entire seven years of additional schooling necessary to bring a person from less than eight years schooling to high school completion by the cost per year for secondary students, when actually only six years of this could be considered as being on the secondary level.

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<sup>53</sup>National Educational Finance Project, "Measuring Educational Needs and Costs," Alternative Programs for Financing Education (Gainesville, Florida: National Educational Finance Project, 1971), pp. 156-67.

<sup>54</sup>"1973 Cost of Buildings Index," School Management, vol. 17, no. 6 (June-July 1973), p. 14.

U.S. Office of Education data for 1967-68 were used to calculate the average educational and general expenditure per college student to be \$1,905. This figure did not include capital outlay. Therefore, Levin took the book value of physical plant assets of all institutions, multiplied by a 10 percent combined rate for interest and depreciation, and divided it among college students to obtain a capital outlay cost of \$640 per student. This, added to the \$1,905, yielded an average total cost per year per college student of about \$2,545.

To calculate the upper limit of investment costs, Levin assumed that additional expenditures equal to what was already being spent must be made for each potential dropout over his entire elementary and secondary career. Thus, six times the estimated expenditure of \$728 for each of the elementary grades, and six times the \$1,214 for each of the secondary grades, for each of the men in the 25 to 34 year old bracket who did not complete high school, would represent an additional expenditure of about \$34 billion. When this figure was added to the basic expenditures for their additional years in school of \$23 billion (the lower limit), the upper limit of the cost to alleviate the inadequate education among the 25 to 34 year old group of males was estimated by Levin to be \$57 billion. Selecting the midpoint of the range from \$23 billion to \$57 billion as the most reasonable estimate of costs, Levin estimated \$40 billion as being the investment figure required to alleviate the social costs of inadequate education among this group of males.

As a result of his procedure thus far, Levin had estimated an increase of \$237 billion in lifetime income and \$71 billion in tax revenues from this income as the payoff to society for an investment of only about \$40 billion. This payoff becomes even larger when estimates

of welfare and crime-related expenditures attributable to an inadequate education are included.

Measurement of Education-Related  
Welfare Expenditures

The major types of welfare programs supported by the local, state, and federal governments are old age assistance, aid to the blind, aid to the permanently and totally disabled, aid to families with dependent children, medical assistance payments related to AFDC, general assistance, and unemployment compensation. Not all of these welfare programs can be said to be education-related. Those that seem to be unrelated to educational attainments are the programs for old age assistance, aid to the blind, and aid to the permanently and totally disabled. There are several categories of welfare, however, that seem to bear a direct relationship to inadequate education. These include aid for dependent children (AFDC), medical assistance payments related to AFDC, general assistance, and unemployment compensation. These seem to be directly related to educational attainment because eligibility for them is contingent upon income and employment which in turn have been shown to be a function of education.

To receive AFDC, a family must have a dependent child under the age of 18, dependency being defined as the continued absence, death, or incapacity of at least one parent. Levin cited several studies which indicated that AFDC mothers had lower levels of educational attainment, had longer periods of unemployment and less probability of employment, and had lower income when employed. Studies were also cited which indicated a similar pattern relating education to the employability and income of AFDC males. A review of additional studies also supported the AFDC-

education link. For example, studies by the U.S. Department of Health, Education, and Welfare have shown that the median levels of education of incapacitated and unemployed AFDC fathers were far below the national median, and that these men were "handicapped educationally in comparison with other men." About 76 percent of the incapacitated fathers and 61.2 percent of the unemployed fathers did not have a high school education. An additional 15.9 percent was in the first group, and 22.8 percent in the latter group whose educational level was unknown and who could presumably raise these amounts even higher.<sup>55</sup> Later figures indicated that 84 percent of all AFDC unemployed fathers lacked a high school education.<sup>56</sup> Of the AFDC mothers, 82.5 percent were also shown to be lacking a high school education; this was reported to be an important factor related to their employment potential.<sup>57</sup> The proportion of AFDC mothers known to have completed at least high school was 1.5 times greater for the employed than for the unemployed.<sup>58</sup> These empirical data support the obvious conclusion that AFDC recipients who did become self-supporting generally had more education than those who did not, regardless of race.

Medical assistance payments for AFDC recipients are also education-related. To qualify for assistance, the recipient must be medically

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<sup>55</sup>David B. Epply, "The AFDC Family in the 1960's," Welfare in Review, vol. 8, no. 5 (September-October 1970), pp. 11-13.

<sup>56</sup>Edward Prescott, William Tash, and William Usdane, "Training and Employability: The Effect of MDTA on AFDC Recipients," Welfare in Review, vol. 9, no. 1 (January-February 1971), p. 2.

<sup>57</sup>Perry Levinson, "How Employable are AFDC Women," Welfare in Review, vol. 8, no. 4 (July-August 1970), pp. 12-13.

<sup>58</sup>Howard Oberhea, "AFDC Mothers: Employed and Not Employed," Welfare in Review, vol. 10, no. 3 (May-June 1972), pp. 60-61.

needy which means that probably many individuals and families lack the income to pay for required medical services because of low educational attainment, just as in the case of the AFDC category.

General assistance provides aid to the poor who are ineligible for other federal programs, such as AFDC, but who still may be classified as needy. These include such individuals as single persons, childless couples under 65 who are not disabled or blind, or families with children and employed male heads. Because of the basic nature of these programs in providing aid to low-income households, the same ties to inadequate education can be said to exist as in the case of the AFDC programs.

The relationship between inadequate education and the receiving of unemployment compensation, though direct, according to Levin is lower than it might be if all unemployment were covered under a uniform set of benefits. This statement is based upon the fact that persons who have never held jobs or who have worked for only short periods of time, many of whom are educationally disadvantaged, are not covered by the program. In addition, the fact that benefits are related to previous earnings means that those with lower educational attainment and lower earnings will receive lower benefits. Obviously, not all unemployed persons have an inadequate education, as evidenced by the large numbers of unemployed engineers in some areas, but in most cases, the so-called marginal worker, with his limited skills, is the last to be hired and the first to be fired.

Having established the conceptual base linking education to welfare reception, Levin undertook to estimate the education-related costs of welfare. In so doing, only the education-related categories of welfare

were considered, and both an upper limit and a lower limit were estimated. As in the case of the educational costs previously measured, the midpoint of the range of the two limits was considered by Levin as being the best estimate of the welfare costs associated with undereducation.

The upper limit was established by assuming that 50 percent of the AFDC, medical assistance payments for AFDC families, and general assistance payments, plus 25 percent of unemployment compensation, was attributable to education. Levin based the lower proportion assigned to unemployment compensation on the two provisions of this coverage that make it less sensitive to lower educational attainment previously mentioned, i.e., the fact that national economic conditions can cause even highly trained people to become unemployed, and the fact that benefits are contingent upon previous employment and based on previous earnings. The lower limits were set at 25 and 15 percent of welfare cost for the two categories. Levin's estimates of education-related welfare costs are presented in Table 13. The upper limit was estimated to be about \$4 billion per year and the lower limit \$2.1 billion per year. The midpoint of the range, about \$3 billion per year, was considered to be the most reasonable overall estimate of costs of welfare incurred because of insufficient education.

TABLE 13

Estimated Cost of Welfare Expenditures From  
Inadequate Education in 1970

	(millions)
Aid to Families with Dependent Children	\$4,082
Medical Assistance	1,199
General Assistance	<u>640</u>
Public Assistance Total	<u>5,921</u>
Unemployment Compensation	4,322
Upper Estimate:	
Public Assistance Total x 50 Percent	2,961
Unemployment Compensation x 25 Percent	<u>1,081</u>
Upper Estimate Total	<u>4,042</u>
Lower Estimate:	
Public Assistance Total x 25 Percent	1,480
Unemployment Compensation x 15 Percent	<u>648</u>
Lower Estimate Total	2,128

Measurement of Education-Related Costs of Crime

In their study of the spillover of public education costs and benefits, Hirsch, Segelhorst, and Marcus commented that: "Some portion of criminal behavior can be attributed to a lack of education, and that portion would be a cost of education."<sup>59</sup> As his final measurement of the economic externalities of education, Levin attempted to estimate that portion of crime-related expenditures that may reasonably be

<sup>59</sup> Hirsch, Segelhorst, and Marcus, op. cit., p. 342.

attributed to the inadequate education of the population. As with the other phenomena measured, Levin first made an analysis of the conceptual relationship between inadequate education and crime before establishing the empirical procedure for estimating the cost.

Levin found that a substantial body of statistical evidence existed linking low educational attainment to crime and cited a few studies exemplifying this evidence. He also cited several of the many studies documenting the tie between education and juvenile delinquency. Since education has been found to be an important determinant of both income and employment, he also thought it useful to note evidence that related income and employment to criminal behavior. One such study found that a 10 percent rise in family income may be expected to reduce delinquency rates by between 15 and 20 percent in areas of high delinquency.<sup>60</sup>

In addition to those studies noted by Levin, over the years a substantial number of other studies have been made showing a high correlation between inferior educational attainment and crime. In 1940, the median grade of school completed by prisoners was found to be 7.4, as compared to 8.3 for others. More importantly, in proportion to their numbers, about four times as many persons with no schooling as persons who had completed high school were in prison.<sup>61</sup> In 1951, Chenault estimated that between 10 and 30 percent of all prisoners admitted to correctional institutions of all types throughout the

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<sup>60</sup>Belton Fleisher, "The Effect of Income on Delinquency," American Economic Review, vol. 56, no. 1 (March 1966), pp. 118-137.

<sup>61</sup>Joseph D. Lohman, Lloyd E. Ohlin, and Dietrich C. Reitzes, Description of Convicted Felons as Manpower Resources in a National Emergency, p. 24 as cited in Edwon H. Sutherland and Donald R. Cressey, Principles of Criminology, 7th edition (New York: J. P. Lippincott Co., 1966), p. 251.



country were illiterate.<sup>62</sup> A 1955 study found that of the 4,000 inmates over age 17 admitted to the Texas prison system, 5 percent had not completed the first grade, 44 percent had not completed the eighth grade, and 89 percent had not completed high school. A parallel study in New Jersey yielded the comparable percentages of 3.6, 41, and 91. These percentages were much higher than those for the general population.<sup>63</sup> A comparison of the educational attainment of persons aged 25 to 64 in correctional institutions to those in the general population in 1960 showed that more than four-fifths of the prison inmates had not completed high school as compared with about one-half of the general population of the same ages. In fact, more than one-half of the prisoners had not even reached secondary school, as compared to about one-third of the general population.<sup>64</sup>

More recent data included in Table 14 indicate that while the median years of school completed for those in correctional institutions had continued to rise, it was still significantly lower than that of the general population. Also, 75 percent of those in prison had not received a high school education, as compared to 45 percent of those in the general population in the same year.

These differences do not, of course, prove that all crime is due to low educational attainment. The low educational attainment may

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<sup>62</sup>Price Chenault, "Education," in Paul W. Tappan, ed., Contemporary Corrections (New York: McGraw-Hill, 1951), p. 224.

<sup>63</sup>Albert K. Cohen, "The Schools and Juvenile Delinquency," Subcommittee to Investigate Juvenile Delinquency, pp. 106, 110, as cited in Sutherland and Cressey, op. cit., p. 251.

<sup>64</sup>Martin R. Haskell and Lewis Jablonsky, Crime and Delinquency (Chicago: Rand McNally and Co., 1970), pp. 389-90.

be reflective or concomitant of low socioeconomic status. However, the fact that a person does have an inadequate education, with its limited occupational choices, low income and/or unemployment, and lower social status, seems to increase the likelihood of his turning to illegal means to fulfill his social and economic desires.

TABLE 14

Educational Attainment of Persons in State and Federal Prisons and Reformatories Compared to That of the General Population, 1970

Years of School Completed	Percentage of Inmates in Correctional Institutions	Percentage General Population
Elementary: 1-4	6.4	5.3
5-7	17.6	9.1
8	16.2	13.4
High School: 1-3	34.8	17.4
4	19.1	34.0
College: 1-3	4.9	10.2
4 or More	1.0	11.0
Median Years	9.8	12.2

Source: U.S. Department of Commerce, Bureau of the Census, "Persons in Institutions and Other Group Quarters, July, 1973," Table 24, and Statistical Abstract of the U.S. 94th Annual Edition, 1974, Table 175.

In another problem area related to crime, civil rights, and disorders, educational attainment has also been shown to have a high correlation. In a survey conducted by the National Advisory Commission on Civil Disorders in twenty cities where civil disorders had occurred,

inadequate education and underemployment or unemployment, which is directly related to educational attainment, were included in the top four grievances of riot participants. Additionally, the typical ghetto riot participant was found to be a high school dropout. After an extensive study of self-reported rioters, counterrioters, and non-involved, the Commission reached the conclusion that: "a high level of education . . . not only prevents rioting, but is also more likely to lead to active, responsible opposition to rioting."<sup>65</sup>

The categories of crime-related expenditures related by the President's Commission on Law Enforcement and Administration of Justice for the fiscal year, 1965, and their accompanying costs are reported in Table 15.

To determine the costs of education-related crime, Levin used basically the same empirical procedure that was used to calculate education-related welfare costs. That is, first, those categories of crime-related expenditures that were education-related were broken out from the list of all crime-related costs; and, second, both an upper and a lower limit of costs of crime attributable to inadequate education were estimated and the midpoint of the range between them was considered to be the most reasonable estimate of the costs.

For a crime-related cost category to be considered to be education-related, Levin used two criteria. First, it should reflect expenditures that are likely to decline if levels of educational attainment were to be increased. Second, it should reflect a "real" sacrifice

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<sup>65</sup> National Commission on the Causes and Prevention of Violence, *Crimes of Violence*, vol. 11 (Washington, D.C.: U.S. Government Printing Office, 1968), p. 394.

in resources rather than just a transfer of goods from one group in society to another as in the case of involuntary transfers. On the basis of these two criteria, Levin judged three categories not to be education-related. These were: involuntary transfer; other crimes; and illegal goods and services. The remaining categories were deemed to reflect a social burden and appeared to be related to poor education.

Levin also calculated another category of crime-related costs in addition to those reported in Table 15. This was the loss of income and national output resulting from the large source of manpower that is imprisoned. Based upon the 1965 average daily adult population of correctional institutions of approximately 363,000, and a figure of \$3,000 as annual income, Levin estimated a national sacrifice in income from the prison population of about \$1.1 billion. The median wage for males in 1965 was actually \$4,400, but, because of the lower levels of educational attainment among the prison population, and, because the 363,000 figure included females who have lower annual incomes, the more modest figure of \$3,000 was used by Levin. The foregone income figure of \$1.1 billion was also reduced by \$100 million to account for the modest amount of work done by prisoners and for the time allocated to training programs. Thus, the net foregone income of inmates for 1965 was estimated to be about \$1 billion.

TABLE 15

Economic Impact of Crimes and Related  
Expenditures, 1965

	(millions)
Crimes Against Persons:	
Homicide	\$ 750
Assault	<u>65</u>
Total	<u>815</u>
Crimes Against Property:	
Property Destroyed: Arson and Vandalism	300
Involuntary Transfer:	
Unreported Commercial Theft	1,400
Robbery	-----
Burglary	600
Larceny	-----
Auto Theft	-----
Embezzlement	200
Fraud	1,350
Forgery and Other	<u>82</u>
Total	<u>3,932</u>
Other Crimes:	
Driving Under Influence	1,816
Tax Fraud	100
Abortion	<u>120</u>
Total	<u>2,036</u>
Illegal Goods and Services:	
Narcotics	350
Loan-sharking	350
Prostitution	225
Alcohol (tax loss)	150
Gambling	<u>7,000</u>
Total	<u>8,075</u>
Public Law Enforcement and Criminal Justice:	
Police	2,792
Corrections	1,034
Prosecution and Defense	125
Courts	<u>261</u>
Total	<u>4,212</u>

TABLE 15 (Continued)

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Private Costs Related to Crime:	
Prevention Services	1,350
Prevention Equipment	200
Insurance (overhead costs)	300
Private Counsel, Bail, Witness Expense	<u>60</u>
Total	<u>1,910</u>
 Total	 20,980

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Levin's estimates of costs of crime attributable to inadequate education are presented in Table 16. The categories of relevant costs amounted to \$8.2 billion. With an upper limit of 50 percent the estimated cost of education-related expenditures for crime was about \$4.1 billion. With a lower limit of 25 percent, the cost estimate was about \$2 billion. The midpoint of the range, judged to be the best estimate of the costs of crime attributable to inadequate education for the year 1965, was about \$3 billion.

TABLE 16

Estimated Costs of Crime Attributable to  
Inadequate Education

	(millions)
Costs of Crimes Against Persons and Property:	
Homicide	\$ 750
Assault	65
Arson and Vandalism	<u>300</u>
Total	<u>1,115</u>
Law Enforcement and Judicial	4,212
Private Costs	1,910
Foregone Income of Inmates	<u>1,000</u>
Total	<u>8,237</u>
Attributable to Inadequate Education:	
Upper Limit, 50 Percent of Total	4,118
Lower Limit, 25 Percent of Total	2,059

Summary of the Review and Critique  
of the Levin Procedure

The Levin procedure for measuring the economic externalities of inadequate education was based upon an analysis of the conceptual relationship between inadequate education and the social costs associated with foregone national income, foregone tax revenues, welfare expenditures, and expenditures related to crime. A review of related literature and research supported the conceptual relationship Levin had established between inadequate education and each of these phenomena.

After having established the conceptual relationship, the second step in the Levin procedure was to establish a set of empirical procedures for estimating the education-related social costs of each of these items. In the instances of measuring the education-related costs associated with welfare and crime expenditures, the procedure was: first, to isolate the particular categories of welfare and crime that seemed to be most directly related to education; second, to aggregate the costs associated with the individual categories; and third, to calculate a percentage of this aggregate as representing the upper limit of cost and a lower percentage as the lower limit of cost, and then use the midpoint of the range to represent the most reasonable estimate of the education-related costs associated with each phenomenon. This study produced no evidence which would validate or invalidate Levin's procedure for estimating the economic externalities associated with these two categories.

In the measurement of foregone national income and foregone tax revenues, Levin's procedure was: first, to compare the actual distribution of educational attainment of a group of males 25 to 34 with the hypothetical distribution that would result if all these males completed high school and some of the additional graduates continued on to college (the rate of continuance being based upon the then-present continuation rates for nonwhites); second, to compare the expected lifetime incomes of the men under actual distribution of educational attainment with the lifetime incomes under the hypothetical distribution to obtain an estimate of foregone national income; third, based on data relating personal income to tax revenues, to determine the amount of foregone tax revenue associated with this loss of national



income; and, fourth, to measure the educational costs of providing these men with the levels of education in the hypothetical distribution and compare these costs with the foregone national income and foregone tax revenues.

The performance of step two in the above procedure was based upon assumptions made on a number of conceptual issues which a review of the literature and research indicated to be the weakness of the Levin procedure. For example, Levin reduced his estimates of foregone national income by 25 percent to account for factors other than education which affect expected lifetime earnings. A review of the research revealed that the ability adjustment made by Levin was not as large as most researchers feel is appropriate in calculations dealing primarily with high school graduates or below. In this step Levin also failed to discount future income streams by some rate to reflect the fact that future income has less value than the same amount derived in the present and to allow comparisons of alternative investments on the basis of present value. Levin justified his failure to do so primarily on the fact that he had also failed to adjust for the expected 3 percent increase in productivity of the workers, and thus the failure to adjust income streams upward for this 3 percent increase in productivity was the same as tacitly assuming a 3 percent discount rate. Not only did examination of the data reveal that these two adjustments do not cancel each other out, but also a review of the literature indicated that even had the tacit assumption of a 3 percent discount rate held true, this rate would have been lower than optimally desired. The literature suggested that rather than calculating results on the basis of only one discount rate, a more

desirable approach would be to base calculations on several different rates which would allow comparison of alternative investments.

In this step in his procedure, Levin also assumed that due to disparities between white and nonwhite incomes at the same level of educational attainment, census data related to expected lifetime income for all males should be divided into separate lifetime incomes for whites and nonwhites. A review of more recent data revealed that while some disparity did remain between white and nonwhite income, the effects of desegregated educational systems and affirmative action programs were reducing these disparities to the extent that in a short period this type of calculation might no longer be necessary.

In Levin's calculations of the educational costs necessary to raise the educational attainment of his cohort, he measured the two main components of direct costs, current expenditures and capital outlay, but did not include any measurement of the indirect cost of foregone student income included by some researchers in the measurement of educational costs. However, a review of the literature supported Levin's failure to include this measurement. In the measurement of educational costs, however, analysis suggested that improvements were indicated in the calculations of current expenditures and capital outlay for elementary and secondary students and in the calculation of annual costs times years of additional schooling.

The results of the review and critique of the Levin procedure included in this chapter served as the basis of the formulation of a model to measure the economic externalities of education presented in Chapter III.

### CHAPTER III

#### A MODEL FOR MEASURING SELECTED ECONOMIC EXTERNALITIES OF EDUCATION

The goal of any model is to explain or predict. With this particular model, the purpose is to provide noneconomists, particularly decisionmakers in the various hierarchies of government responsible for educational policy, with a procedure by which to measure the possible economic benefits of additional investments in education. Since the model attempts to measure the costs and benefits associated with a particular investment, it may be considered a cost-benefit analysis. This type of analysis is of particular value to decisionmakers who, as pointed out in Chapter I, are demanding more from educators than the traditional "educated-citizenry" justification for additional expenditures. This procedure "forces those responsible to quantify costs and benefits as far as possible rather than rest content with vague qualitative judgments or personal hunches."<sup>1</sup>

Models are developed by a combination of theories and concepts with empirical research. The model presented in this chapter is based upon the concepts and research explored in the review and critique of the Levin procedure presented in Chapter II. It is designed to measure the selected externalities of foregone national

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<sup>1</sup>A. R. Prest and Ralph Turvey, "Cost Benefit Analysis: A Survey," The Economic Journal (December 1965), p. 730 as cited in Cohn, op. cit., p. 162.

income, foregone tax revenues, increased expenditures for welfare, and increased costs of crime associated with the inadequate education of a particular sample. The amount derived from a measurement of these negative costs associated with the inadequate education of the sample is the same as would be presented as a benefit if the sample were to possess an adequate education.

### Measurement of Foregone National Income

#### Sample Selection

The first step in the model is to determine the sample whose educational externalities are to be measured and their distribution of educational attainment. Following the rationale presented by Levin, the sample must be one whose members are old enough to have completed their education but still have a number of years left in their work careers.

#### Hypothetical Distribution

Next, the hypothetical distribution of educational attainment that would result if all members of the sample were to attain a minimum of high school completion is calculated. In calculating this hypothetical distribution, it is assumed that a number of the additional high school graduates would continue on to college and that the rates of continuance beyond high school for the entire sample would follow the rates of continuance for nonwhites of the sample. This assumption seemed justified since the population is predominantly white and, according to 1972

census data, only about 25 percent of nonwhites as compared to 42.7 percent of whites continued on to college.<sup>2</sup>

### Lifetime Income

The actual distribution of educational attainment is then compared to the hypothetical distribution to obtain the number of additional persons, by race, who would complete their schooling at each level of education, high school and beyond. On the basis of these data, calculations of foregone national income are performed.

However, since the review of the literature revealed that differentials between white and nonwhite income at the same levels of education continue to exist, before foregone national income can be calculated, census data reporting expected lifetime income for all males must be divided into separate lifetime income for whites and nonwhites. These separate incomes are obtained by the following formula:

$$\begin{array}{l} \text{Expected Life-} \\ \text{time Income} \\ \text{for All Males} \\ \text{at That} \\ \text{Education} \\ \text{Level}^3 \end{array} = \left( \begin{array}{l} \text{Percent} \\ \text{White} \\ \text{at That} \\ \text{Level of} \\ \text{Educational} \\ \text{Attainment}^4 \end{array} \right) (X) + \left( \begin{array}{l} \text{Percent} \\ \text{Nonwhite} \\ \text{at That} \\ \text{Level of} \\ \text{Educational} \\ \text{Attainment}^5 \end{array} \right) \left( \begin{array}{l} \text{Nonwhite} \\ \text{Income as} \\ \text{Percent of} \\ \text{White Income} \\ \text{at That} \\ \text{Level}^6 \end{array} \right) (X)$$

<sup>2</sup>U.S. Department of Commerce, Bureau of the Census, "Educational Attainment: March, 1972," Current Population Reports, series P-20, no. 243 (November 1972), Table 1.

<sup>3</sup>Obtained from U.S. Department of Commerce, Bureau of the Census, Current Population Reports, series P-60 data.

<sup>4</sup>Obtained from U.S. Department of Commerce, Bureau of the Census, "Education Attainment," series P-20 data.

<sup>5</sup>Ibid.

<sup>6</sup>Obtained from U.S. Department of Commerce, Bureau of the Census, "The Social and Economic Status of Negroes in the U.S.," series P-23 data.

When  $X$  = White Lifetime Income,  
 then, Nonwhite Income =  $(X)$  (Nonwhite Income as Percent of White Income)

Census data relating to expected lifetime income are reported at different discount rates and different rates of annual productivity increase. The choice of the discount rate will affect the magnitude of the foregone income. Thus, the literature suggested that results be reported on the basis of income calculated. The review of the literature further suggested that results be reported on the basis of alternative discount rates. This model bases its calculations of foregone income on a discount rate of 0 percent with an annual productivity increase of 0 percent (which is the basis of the Levin calculations), on a discount rate of 3 percent with an annual productivity increase of 3 percent (which is what Levin indicated he had tacitly assumed), and on a discount rate of 5 percent with an annual productivity increase of 3 percent (which is what the review of the literature suggested as most appropriate). The above calculations of separate lifetime incomes for whites and nonwhites are performed for expected lifetime incomes at each of these discount rates.

#### Adjusted National Income Foregone

Once lifetime income has been calculated, the lifetime incomes for all persons at the actual distribution of educational attainment are subtracted from their expected lifetime incomes under the hypothetical distribution to obtain an estimate of foregone income. This estimate of gross income foregone is then deflated by a 33 percent ability adjustment to account for nonschooling factors which affect income differentials. The resulting figure is the estimated national income foregone as a result of the inadequate education of the sample.

### Measurement of Tax Losses

The next step in the model is the calculation of foregone tax revenues. To accomplish this step, U.S. Department of Commerce data<sup>7</sup> are used to calculate federal and state-local taxes as a percent of personal income as in Table 11. Once these percentages have been calculated, they are applied to the foregone national income to obtain the estimated loss in tax revenues.

### Measurement of the Cost of Providing Adequate Education

In comparing these social costs or unrealized benefits of inadequate education, the next step in the model involves a procedure for measuring the costs of providing the sample with a minimum of a high school education, as well as the additional costs that would accrue as a result of a greater number of high school graduates continuing on to college. As in the Levin procedure, the model calculates a lower and an upper limit of costs and uses the midpoint of the range of the two limits as the best estimate of educational costs.

### Elementary and Secondary

The lower limit of educational costs is based on the assumption that present expenditures are sufficient to retain all members of the sample in school to a level of high school completion. The lower limit uses U.S. Office of Education data which report current expenditures per pupil in average daily membership (ADM) for all elementary and secondary pupils. However, the review of the literature found per

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<sup>7</sup>U.S. Department of Commerce, Office of Business Economics, "National Income and Products Accounts," Survey of Current Business.

pupil expenditures at the elementary level to represent only about 80 percent of those at the secondary level. Thus, the U.S. Office of Education data must be divided into separate current expenditures for elementary and secondary students. This is calculated by the following formula:

$$\text{Current Expenditures Per Pupil in ADM} = \frac{(X) \left( \frac{\text{Number of Secondary Students}}{\text{Total Number of Elementary and Secondary Students}} \right) + (.8X) \left( \frac{\text{Number of Elementary Students}}{\text{Total Number of Elementary and Secondary Students}} \right)}{1}$$

When  $X$  = Annual Expenditure Per Secondary Student,  
then,  $.8X$  = Annual Expenditure Per Elementary Student.

The review of the literature also indicated a difference in capital outlay costs between elementary and secondary grades, with elementary capital outlay representing only 66 percent of secondary capital outlay. Therefore, the capital outlay estimate of the U.S. Office of Education must also be divided into separate capital outlay expenditures for elementary and secondary students. This is calculated by the formula:

$$\text{Total Capital Outlay} = (X) \left( \frac{\text{Total Number of Secondary Students}}{\text{Total Number of Elementary and Secondary Students}} \right) + (.66X) \left( \frac{\text{Total Number of Elementary Students}}{\text{Total Number of Elementary and Secondary Students}} \right)$$

When  $X$  = Per Pupil Capital Outlay-Secondary,  
then,  $.66X$  = Per Pupil Capital Outlay-Elementary

Adding these separate capital outlay costs to the separate current expenditure costs yields the total annual expenditure for elementary and secondary students.

### Higher Education

U.S. Office of Education data for average annual expenditures per pupil in institutions of higher education are used by the model as the annual costs for those continuing on to college. Annual expenditures per college student for capital outlay are calculated by using U.S.



Office of Education data relative to the value of physical plant assets of institutions of higher education. These are multiplied by a 10 percent combined rate for interest and depreciation, and the figure obtained is then divided among the number of college students to obtain per pupil capital outlay. Expressed as a formula this would be:

$$\text{Annual Capital Outlay Per College Student} = \frac{(.1) (\text{Value of Physical Plant Assets})}{\text{Number of College Students}}$$

### Total Educational Costs

When these estimates of elementary, secondary, and college costs are multiplied by the number of years of additional schooling needed to bring each dropout in the actual distribution of educational attainment to the levels of attainment in the hypothetical distribution, the lower limit of educational costs is obtained.<sup>8</sup>

The upper limit of educational costs assumes that additional expenditures equal to what is already being spent must be made for each potential dropout over his entire elementary and secondary career. Thus, six times the estimated expenditure for each of the elementary grades, and six times the estimated expenditures for each of the secondary grades, for every person in the sample who did not complete high school, would represent the necessary additional expenditures. This figure added to the basic expenditures for their additional years in school (the lower limit) represents the upper limit. The midpoint of the range between the lower and the upper limit is the estimated cost to fund an adequate education for the sample.

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<sup>8</sup>Of those males 25 to 29 years of age in the 1972 census (Table 17), with less than an eighth grade education, only less than one-fourth actually had less than a fifth grade education. Therefore, it seemed reasonable to begin calculations of the number of additional years necessary for high school completion for the entire group at a level of fifth grade completion.

Measurement of Education-Related  
Welfare Expenditures

The major types of welfare programs supported by the local, state, and federal governments are old age assistance, aid to the blind, aid to the permanently and totally disabled, aid to families with dependent children, medical assistance payments related to AFDC, general assistance, and unemployment compensation. The Statistical Abstract of the United States provides data for the total amounts of expenditures for these programs. However, the review and critique of the Levin procedure found only those categories of aid for dependent children (AFDC), medical assistance payments related to AFDC, general assistance, and unemployment compensation to bear a direct relationship to education. Therefore, to calculate the welfare costs associated with inadequate education, only these categories of welfare expenditures are considered in the model. An upper limit and a lower limit of costs are estimated and the midpoint of the range is considered as being the best estimate of welfare costs associated with undereducation.

As in the Levin procedure, the upper limit is established by assuming that 50 percent of the AFDC, medical assistance, and general assistance, plus 25 percent of unemployment compensation, is attributable to inadequate education. The lower limits are set at 25 and 15 percent of welfare expenditures for the categories. The midpoint of the range is considered to be the model's best estimate of costs of welfare incurred because of inadequate education.

## Measurement of Education-Related Costs of Crime

### Criminal Activities

The major categories of crime-related expenditures established by the President's Commission on Law Enforcement and Administration of Justice are crimes against persons, crimes against property, other crimes, illegal goods and services, public law enforcement and criminal justice, and private costs related to crime. Of these, only crimes against persons, arson and vandalism (a sub-category of crimes against property), public law enforcement and criminal justice, and private costs related to crime meet the two criteria established by Levin, and used in this model, that permit them to be considered education-related. These two criteria are: (1) that the category should reflect expenditures that are likely to decline if levels of educational attainment were to be increased, and, (2) that the expenditures reflect "real" sacrifices in resources rather than just a transfer of goods from one group in society to another.

### Incarceration

In addition to these categories of costs, the model estimates the national sacrifice in income resulting from the incarceration of the prison population. This is calculated by multiplying the daily adult prison population by the median wage for the corresponding year, and then deflating this figure by one-third to account for the lower levels of educational attainment among the prison population, the modest amount of work done by prisoners, and time allotted to training programs.

The model estimates education-related costs of crime by aggregating the costs of the relevant categories, assuming an upper limit of 50

percent and a lower limit of 25 percent of the costs to be education-related, and using the midpoint of their range as the best estimate of the costs of crime attributable to inadequate education.

The model presented in this chapter provides a procedure by which to measure the costs and benefits or externalities associated with the educational attainments of a particular sample. It is based upon the concepts and research explored in the review and critique of the Levin procedure presented in Chapter II. In the following chapter, this model is applied to the sample of males 25 to 29 years old in the 1972 census.

## CHAPTER IV

### ILLUSTRATIVE APPLICATION OF THE MODEL

In this chapter, the model developed in Chapter III for measuring foregone national income and foregone tax revenues will be applied to a sample of males in the 1972 census. The procedure developed in the model for measuring the investment necessary to provide this sample with an adequate education will also be applied to the sample data. In addition, estimated costs of education-related welfare expenditures and costs of crime will be calculated based upon the model procedure.

#### Measurement of Foregone National Income

The first step in the application of the model is to choose the sample whose educational externalities are to be measured and to determine their distribution of educational attainment. The group chosen for the illustrative application of the model was the group of males ages 25 to 29 in the 1972 census. Table 17 gives the educational attainment and percentage distribution of the sample. In terms of percentages, the educational attainment for nonwhites was much lower than that for whites. The total number of whites failing to attain a high school education was 1,128,000, and for nonwhites the total number of persons dropping out was 260,000. The level at which the closest percentage correlation existed was for four years of high school; 39.6 percent of whites and 40.1 percent of nonwhites were distributed in this group.

TABLE 17

Educational Attainment for Males 25 to 29 Years of Age,  
March 1972, by Race  
[in thousands]

	Elementary		High School		College		
	Less Than 8 Years	8 Years	1 to 3 Years	4 Years	1 to 3 Years	4 Years	5+ Years
Total Males Percentages	263 3.7	229 3.2	895 12.6	2,822 39.6	1,341 18.8	893 12.5	673 9.5
White Males Percentages	207 3.3	190 3.0	731 11.5	2,534 39.6	1,246 19.5	845 13.3	630 9.9
Nonwhite Males Percentages	56 7.5	39 5.2	165 22.2	298 40.1	96 12.9	48 6.4	42 5.7

Source: U.S. Department of Commerce, Bureau of the Census, "Educational Attainment: March, 1972," Current Population Reports, series P.20, no. 243 (November 1972), Table 1.

As compared to the distribution in Table 17, if these same individuals were educated under a policy requiring a minimum of a high school completion, their hypothetical distribution of educational attainment would be that shown in Table 18. This was calculated by assuming that if all persons completed high school, a continuation of education beyond high school would follow the same pattern as that in the actual distribution for nonwhite males ages 25 to 29.

TABLE 18

Hypothetical Distribution of Educational Attainment for  
Males 25 to 29 Years of Age, March 1972, Under  
a Policy of High School Completion  
[in thousands]

	High School	College		
		1 to 3 Yrs.	4 Yrs.	5+ Yrs.
White Males	3,219	1,469	956	729
Percentages	50.5	23.1	15.0	11.4
Nonwhite Males	458	147	73	65
Percentages	61.6	19.8	9.8	8.7

The estimated number of additional persons that would be educated at each level under a policy of universal high school completion is shown in Table 19. An additional 695,000 white males and 160,000 nonwhite males were projected to have completed high school before entering the labor market, and 433,000 additional white males and 99,000 additional nonwhite males were projected to have received some college training.

TABLE 19

Estimated Number of Additional Males 25 to 29 Years of  
Age Completing Education at Each Level Under a  
Policy of High School Completion

	High School	College		
		1 to 3 Yrs.	4 Yrs.	5+ Yrs.
White Males	695,000	223,000	111,000	99,000
Nonwhite Males	160,000	51,000	25,000	23,000
Total	855,000	274,000	136,000	122,000

After the number of additional persons has been estimated, but before national income can be calculated by the application of expected lifetime income, census data reporting lifetime incomes for all males must be divided into separate lifetime income for whites and nonwhites. As stated previously, this calculation is necessary because of the continued difference that exists between the average incomes of whites and nonwhites at the same educational level. Table 20 represents the latest available census figures comparing median income of whites and nonwhites.

To obtain separate lifetime income gains for whites and nonwhites according to educational level, the aggregate figure for all males as reported by the Bureau of the Census, and as presented in the first column in Table 21, was weighted according to the relative percentages of income reflected in Table 20 and according to the percent



TABLE 20

Median Income by Educational Attainment of Males  
25 to 34 Years Old by Race

Years of School Completed	Median Income		Nonwhite Income as Percent of White
	Nonwhite	White	
Elementary: 8 Years or Less	\$ 4,743	\$ 6,618	72
High School: 1 to 3 Years	5,749	7,910	73
4 Years	6,789	8,613	79
College: 1 to 3 Years	7,699	9,190	84
4 Years	8,715	11,212	78
5 Years or More	9,955	11,808	84

Source: U.S. Department of Commerce, Bureau of the Census, "The Social and Economic Status of the Black Population in the U.S., 1972," Special Studies, Current Population Reports, series P-23, no. 46, p. 25.

nonwhites are of whites at each educational level (Appendix B). The following formula was used:

$$\text{Expected Lifetime Income for All Males at That Educational Level} = \left( \begin{array}{c} \text{Percent} \\ \text{White} \\ \text{at That} \\ \text{Level of} \\ \text{Educational} \\ \text{Attainment} \end{array} \right) (X) + \left( \begin{array}{c} \text{Percent} \\ \text{Nonwhite} \\ \text{at That} \\ \text{Level of} \\ \text{Educational} \\ \text{Attainment} \end{array} \right) \left( \begin{array}{c} \text{Nonwhite} \\ \text{Income as} \\ \text{Percent} \\ \text{of White} \\ \text{Income at} \\ \text{That Level} \end{array} \right) (X)$$

When X = White Lifetime Income,  
then, Nonwhite Income = (X) (Nonwhite Income as Percent of White Income)

The calculated results are presented on the basis of three different discount rates: (1) at a discount rate of 0 percent with an annual

productivity increase of 0 percent, (2) at a discount rate of 3 percent with an annual productivity increase of 3 percent, and (3) at a discount rate of 5 percent with an annual productivity increase of 3 percent. The calculated results are given in Table 21.

The lifetime incomes obtained in Table 21 are then applied to the estimated number of additional males at each level under a policy of high school completion to determine the income foregone to the nation as a result of the lower levels of educational attainment of the sample. In effect, the lifetime incomes for all males at the actual distribution of educational attainment are subtracted from their expected lifetime incomes under the hypothetical distribution to obtain the estimated foregone income. This estimate of gross income foregone is then deflated by 33 percent for the ability adjustment. Table 22 reflects the gross income foregone as well as the foregone income after the 33 percent reduction. Depending on the discount rate chosen, society theoretically forfeits a total of either \$136.6, \$134.6, or \$81.9 billion in the form of foregone income over the lifetime of these males as a result of their failure to complete high school.

#### Measurement of Losses in Tax Revenues

Inherent in this loss in national income is a reduction of tax revenues at all levels of government. To determine foregone tax revenues, U.S. Department of Commerce data, as presented in Appendix C, are first used to calculate federal and state-local taxes as a percent of personal income. In 1971, total tax revenues represented 28.3 percent of personal income; of this, 16.5 percent went to the federal government and 11.8

TABLE 21

Estimated Lifetime Income from Age 18 to Age 64 for Males  
by Discount Rate, Race, and Educational Attainment

Years of Schooling Completed	Lifetime Income at 0 Percent Discount Rate with Annual Productivity Increase of 0 Percent			Lifetime Income at 3 Percent Discount Rate with Annual Productivity Increase of 3 Percent			Lifetime Income at 5 Percent Discount Rate with Annual Productivity Increase of 3 Percent		
	All Males	White	Non- white	All Males	White	Non- white	All Males	White	Non- white
Elementary: Less Than 8 Years	\$248,000 301,000	\$263,800 316,200	\$189,900 227,700	\$244,000 297,000	\$259,600 313,000	\$186,900 225,400	\$157,000 188,000	\$167,000 197,500	\$120,200 142,200
High School: 1 to 3 Years	338,000 416,000	355,600 424,500	259,600 335,400	333,000 410,000	350,500 418,400	255,900 330,300	209,000 259,000	220,000 264,300	160,600 208,800
College: 1 to 3 Years	474,000 609,000	479,800 616,400	403,000 480,800	467,000 600,000	472,700 607,300	397,100 473,750	287,000 368,000	290,500 372,500	244,000 290,500
4 Years	705,000	712,100	598,200	695,000	702,000	589,700	427,000	431,300	362,300
5 or More Years									

Source for unweighted figures: U.S. Department of Commerce, Bureau of the Census, Current Population Reports, series P-60, no. 92 (March 1974).

TABLE 22

Estimated Income Foregone as a Result of the Inadequate  
Education of Males 25 to 29 Years Old in 1972

	At 0 Percent Discount Rate with Annual Productivity Increase of 0 Percent		At 3 Percent Discount Rate with Annual Productivity Increase of 3 Percent		At 5 Percent Discount Rate with Annual Productivity Increase of 3 Percent	
	Gross Income Foregone (billions)	After 33 Percent Adjustment	Gross Income Foregone (billions)	After 33 Percent Adjustment	Gross Income Foregone (billions)	After 33 Percent Adjustment
White:						
High School Completion College	\$104.2 62.1	\$ 69.8 41.6	\$102.5 61.3	\$ 68.7 41.1	\$ 65.2 34.4	\$ 43.7 23.0
Total White	166.3	111.4	163.8	109.8	99.6	66.7
Nonwhite:						
High School Completion College	24.5 13.1	16.4 8.8	24.1 12.9	16.1 8.7	15.3 7.4	10.3 4.9
Total Nonwhite	37.6	25.2	37.0	24.8	22.7	15.2
Total All Males	203.9	136.6	200.8	134.6	122.3	81.9

percent went to state and local governments.<sup>1</sup> Application of these percentages to the calculated figures of \$136.6, \$134.6, and \$81.9 billion in foregone income indicates that, for the males of age group 25 to 29, the corresponding amounts of \$22.5, \$22.2, or \$13.5 billion additional tax revenues were lost to the federal government, and \$16.1, \$15.9, or \$9.7 billion to state and local governments as a result of their inadequate education. These losses represent a second societal cost of \$38.6, \$38.1, or \$23.2 billion accordingly.

Measurement of the Costs of Providing an  
Adequate Education for All Males 25 to  
29 Years of Age in 1972

As a next step, the model measures the costs of providing the sample with a minimum of a high school education, as well as the additional costs that would accrue as a result of a greater number of high school graduates continuing on to college. A lower limit of costs is calculated measuring only the expenditures that would be incurred for the additional years of schooling. An upper limit is calculated measuring not only the expenditures necessary for the additional years of schooling, but also the costs that would result if expenditures equal to those presently being spent were to be made throughout the entire elementary and secondary career of the potential dropouts. The midpoint of these two limits represents the best estimate of educational costs.

Estimated total expenditures for all public school purposes in 1972-73 were \$51.9 billion. The average estimated current expenditure per pupil in average daily membership (ADM) was \$961 for all elementary

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<sup>1</sup>See Appendix C.

and secondary pupils.<sup>2</sup> If expenditures per pupil at the elementary level are estimated to be 80 percent of those at the secondary level, then for 1972, the current average expenditure for secondary students would be \$1,040 and for elementary students \$832.<sup>3</sup> If elementary capital outlay expenditures represent 66 percent of secondary capital outlay costs, then capital outlay costs are \$138 at the secondary level and \$90 at the elementary level. When these amounts are added to the current average expenditures, total annual expenditures for a secondary student of \$1,178 and for an elementary student of \$922 are yielded. These estimates were used to compute the costs of additional years of schooling to bring the potential dropouts up to high school completion.

The U.S. Office of Education also reported that the average expenditure per pupil in institutions of higher education in 1971-72 was \$2,850.<sup>4</sup> The average expenditure per college student for capital outlay is obtained by multiplying the book value of physical plant assets of all institutions (\$42.2 billion in 1969-70, the latest available data)<sup>5</sup> by a 10 percent combined rate for interest and depreciation and dividing the obtained figure by the total number of college students. When this is calculated, the average capital outlay cost per college student is

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<sup>2</sup>Statistics of Public Elementary and Secondary Day Schools, O.E. 73-11402 (Washington, D.C.: U.S. Office of Education, 1973).

<sup>3</sup>See Appendix C for calculations of separate current expenditures and capital outlay for elementary and secondary students.

<sup>4</sup>U.S. Department of Health, Education, and Welfare, Office of Education, Financial Statistics of Institutions of Higher Education; Current Funds, Revenues and Expenditures, 1971-72 (Washington, D.C.: U.S. Government Printing Office, 1973), p. 11.

<sup>5</sup>U.S. Department of Health, Education, and Welfare, Office of Education, Financial Statistics of Institutions of Higher Education; Property, 1969-70 (Washington, D.C.: U.S. Government Printing Office, 1971), p. 2.

estimated to be about \$468, yielding a total annual cost per college student of about \$3,318.

Table 23 presents the estimates of the lower limits of investment to provide a minimum of high school completion for all males 25 to 29 years of age, plus college continuation for a portion of the additional high school graduates.

TABLE 23

Estimate of Investment Cost of Providing a Minimum of  
High School Completion and College Continuance

	Number of Additional Persons Completing Level (thousands)	Number of Years Additional Schooling Per Person	Cost Per Year	Total Cost Per Level (billions)
<hr/>				
From Elementary to High School Completion:				
Less Than 8 Years	263	1	\$ 922	
		6	1178	\$2.101
8 Years	229	4	1178	1.079
1 to 3 Years	896	2	1178	2.111
	<hr/>			
Total				5.291
<hr/>				
From High School Completion to:				
1 to 3 Yrs. College	274	2	3318	1.814
4 Yrs. College	136	4	3318	1.805
5 or More Yrs. College	122	6	3318	2.429
	<hr/>			
Total Costs, College				6.052
<hr/>				
Total Investment Costs				11.343
<hr/>				

The cost of providing a high school education for all males in the sample who would otherwise drop out was estimated to be \$5.3 billion, and the cost of providing additional college training for those who might continue their education beyond high school was projected to be about \$6.1 billion. Thus, the lower limit of the cost of a public policy providing for a minimum of a high school education for this group of males was estimated to be about \$11.3 billion. This projection was for the combined number of white and nonwhite dropouts. In contrast to the procedures used with income, as far as expenses were concerned, no cost differentials were associated with race.

To estimate the upper limit of investment, the assumption was made that schools would not be able to retain these potential dropouts by maintaining present expenditure levels and changing focus, but instead that they must make massive additional expenditures. According to the costs of compensatory and other special programs, the assumption was made that the sample would need additional expenditures equal to, or in excess of, that presently being spent on the average per pupil. At the present expenditure levels, yearly expenditures of \$922 were established for elementary students and \$1,178 for secondary students. The sum of these figures for the six elementary and the six secondary years indicated that a total of \$12,600 per pupil would be spent. Therefore, this figure of \$12,600 was added for each of the potential dropouts, representing an additional \$17.5 billion investment at the public school level over the \$11.3 billion of the lower limit which must be spent to prevent their dropping out. Thus, a figure of \$28.8 billion was considered to be the appropriate upper limit of the investment cost.



The midpoint of the range between the upper and lower limits of investment was selected as the most reasonable estimate of costs. The cost to the nation to raise the educational attainment of the sample to a high school completion level and to provide college training for those of the group who might continue would then be \$20.0 billion. The required investment to bring this group to a high school graduation level, without consideration of college continuance, would be the mean of the lower and upper limits of investment costs for high school only, a cost of \$14.05 billion.

Measurement of Education-Related  
Welfare Expenditures

The major categories of public assistance programs listed by the Statistical Abstract of the United States are old age assistance, aid to the blind, aid to permanently and totally disabled, aid to families with dependent children, medical assistance, general assistance, and other. Of these, only those categories of aid for dependent children (AFDC), medical assistance payments related to AFDC, and general assistance bear a direct relationship to educational attainment. However, another form of welfare expenditure, unemployment compensation, has also been found to be educational-related. Therefore, to calculate the welfare costs associated with inadequate education, only the categories detailed above are considered. To calculate education-related welfare expenditures, the costs associated with each of these categories are aggregated, an upper and lower limit of costs estimated, and the midpoint of the range between the two limits is considered as being the best estimate of costs. The upper limit is established by assuming that 50 percent of AFDC, medical assistance, and general

assistance, plus 25 percent of unemployment compensation is attributable to inadequate education. The lower limit is set at 25 and 15 percent of welfare expenditures for the categories.

Table 24 shows the estimated costs of welfare expenditures attributable to inadequate education for a single year, 1973. The upper limit of costs is estimated to be \$10 billion and the lower limit \$5 billion. The midpoint of this range is \$7.5 billion and is considered to be the most reasonable estimate of welfare expenditures related to inadequate education.

TABLE 24

Estimated Cost of Education-Related Welfare  
Expenditures in 1973

	(millions)
AFDC	\$ 7,211
Medical Assistance	9,706
General Assistance	<u>801</u>
Public Assistance Total	<u>17,718</u>
Unemployment Compensation	4,345
Upper Estimate:	
Public Assistance Total x 50 Percent	8,859
Unemployment Compensation x 25 Percent	<u>1,086</u>
Upper Estimate Total	<u>9,945</u>
Lower Estimate:	
Public Assistance Total x 25 Percent	4,430
Unemployment Compensation x 15 Percent	<u>652</u>
Lower Estimate Total	<u>5,082</u>

Source: U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States: 1974 (Washington, D.C.: U.S. Government Printing Office, 1974), Tables 466 and 471.

### Measurement of Education-Related Costs of Crime

The major categories of crime-related expenditures established by the President's Commission on Law Enforcement and Administration of Justice are crimes against persons, crimes against property, illegal goods and services, public law enforcement and criminal justice, private costs related to crime, and other crimes. Of these, only crimes against persons, arson and vandalism, public law enforcement and criminal justice, and private costs related to crime were considered to be education-related. The costs associated with each of these categories are presented in Table 25.

In addition to these categories of costs, also to be considered is the national sacrifice in income resulting from the incarceration of the prison population. In 1970, the average daily adult population of jails and prisons in the United States was 357,292.<sup>6</sup> If all these individuals were released and became gainfully employed, at the median wage in 1970 of \$6,670,<sup>7</sup> their total earnings for 1970 would be about \$2.4 billion. However, as was shown in Chapter II, the prison population tends to be less well-educated than the total population which would affect their earning ability. In addition, not all of the time spent in prison can be considered spent unproductively. Some time is spent in productive labor and training programs. For example, in 1970,

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<sup>6</sup>U.S. Department of Justice, Law Enforcement Assistance Administration, National Criminal Justice Information and Statistics Service, "National Jail Census: 1970," series SC-no. 1 and U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States: 1973 (Washington, D.C.: U.S. Government Printing Office, 1973), Table 284.

<sup>7</sup>U.S. Department of Commerce, Bureau of the Census, "Income in 1970 of Families and Persons in the United States," Current Population Reports, series P-60, no. 80 (October 1971), Table D.

TABLE 25

Estimated Costs of Crime Attributable to  
Inadequate Education

	(millions)
Costs of Crimes Against Persons: <sup>8</sup>	
Homocide	\$ 750
Assault	<u>65</u>
Total	<u>815</u>
Costs of Crimes Against Property:	
Vandalism <sup>9</sup>	813
Arson <sup>10</sup>	<u>769</u>
Total	<u>1,582</u>
Public Law Enforcement and Criminal Justice <sup>11</sup>	21,794
Private Costs <sup>12</sup>	1,910
Foregone Income of Inmates	<u>1,600</u>
Total	<u>27,701</u>
Attributable to Inadequate Education:	
Upper Limit, 50 Percent of Total	13,850
Lower Limit, 25 Percent of Total	6,925

<sup>8</sup>The President's Commission on Law Enforcement and Administration of Justice, Task Force on Assessment, Crime and Its Impact (Washington, D.C.: U.S. Government Printing Office, 1967), p. 44.

<sup>9</sup>U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States: 1974 (Washington, D.C.: U.S. Government Printing Office, 1974), Table 260.

<sup>10</sup>"Fires and Fire Losses Classified, 1972," Fire Journal, vol. 67, no. 5 (September 1973), p. 23.

<sup>11</sup>Statistical Abstract of the United States: 1974, op. cit., Table 262.

<sup>12</sup>Crime and Its Impact, op. cit.

inmate wages in federal prisons alone totaled over \$3 million.<sup>13</sup> Thus, the foregone income figure of \$2.4 billion is deflated by one-third to account for the work done by prisoners, the time allotted to training programs, and the inferior earning capacity of the prison population. This figure is presented along with the other estimates of education-related costs of crime in Table 25.

The total of the relevant categories of crime-related expenditures is about \$27.7 billion. To calculate the proportion of these costs attributable to inadequate education, an upper limit of 50 percent and a lower limit of 25 percent is assumed. The midpoint of this range is used as the best estimate of the costs of crime attributable to inadequate education. For the year 1970 this estimate was about \$10.4 billion.

### Summary

A cost-benefit analysis of the data derived in this study shows that society is paying dearly for its failure to retain its young people in school until they attain a level of adequate education. The illustrative application of the model to the sample of males 25 to 29 in the 1972 census indicated that the nation was losing between \$82 billion and \$137 billion, depending on the discount rate, in foregone income, and between \$23 billion and \$39 billion in foregone tax revenues. In addition, \$7.5 billion in welfare expenditures and \$10.4 billion in crime-related expenditures can be said to be attributable to inadequate education. The total estimate of the nation's economic loss ranged

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<sup>13</sup>U.S. Department of Justice, Bureau of Prisons, Federal Prison Industries, Inc. Board of Directors Annual Report 1971 (Marian, Illinois: Bureau of Prisons, 1972), p. 2.

from \$123 billion to \$194 billion, in contrast to an estimated educational cost of \$20 billion. Obviously, the costs of inadequate education far exceed the investment necessary to alleviate this problem. Moreover, higher levels of educational attainment also result in such benefits as increased political participation and intergenerational mobility, reinforcing the importance of increased investments to raise the educational attainment of the entire population.

## CHAPTER V

### SUMMARY, FINDINGS, CONCLUSIONS, AND IMPLICATIONS

#### Summary

In a system of free public schools such as exists in the United States, the entire society must bear the cost of education, an ever-increasing figure, rather than solely the individual receiving the education. As society has made increased investments in education, the public has exhibited a growing demand for schools to be accountable, to see the other side of the ledger, to see what economic benefits it may expect for increasing investments. In the past, educators have relied primarily on nonquantifiable justifications when referring to the social and economic benefits of education. These are not enough for policymakers in a world of increasing costs and inflation. They are demanding more than an analogy between physical and human capital or the traditional "educated-citizenry" and "educated-manpower" justifications for additional expenditures. Most researchers who have attempted to quantify the economic benefits of education have confined their measurements to one or two kinds of benefits or externalities. The most comprehensive measurements attempted thus far, those by Levin, have had several apparent procedural weaknesses.

Given the paucity of work in this area and the weakness of the Levin procedure, the purpose of this study was to develop a model to provide a procedure by which the possible economic benefits of education

to society might be quantified. In the development of this model, attention was given to:

1. A description and critical examination of the Levin procedure for measuring economic externalities. A step-by-step analysis of Levin's procedure was conducted, with the review of related research used to support or refute the validity of each point.
2. The development of a revised model for measuring selected economic externalities based on the analysis of the Levin procedure. The model included procedures used by Levin that seemed validated by a review of related research, as well as revisions of his procedure justified by the literature.
3. An illustration of possible selected economic benefits of education. The model was used to measure the foregone income and foregone tax revenues of all males aged 25 to 29 included in the 1972 census, to project estimated welfare expenditures and costs of crime, and to calculate the cost of providing the sample with an adequate education.

#### Description of the Model

In the application of the model, first, the actual distribution of educational attainment of a sample is compared to the hypothetical distribution of educational attainment that would result under a policy of high school completion. From a desire to understate rather than overstate, rates of continuance beyond high school are calculated on the basis of the rates of continuance for nonwhites of the sample. Second, the lifetime income of the individuals in the sample under the actual distribution is compared to the lifetime income under the hypothetical



distribution to obtain an estimate of national foregone income. Third, calculations of federal and state-local taxes as a percent of personal income are applied to the foregone national income to obtain the estimated loss in tax revenues. Fourth, the costs of providing the sample with a minimum of a high school education, as well as the college costs that would accrue as a result of the continuation of a portion of the sample on to college are calculated. The cost of providing the sample with an adequate education is estimated to be the midpoint of a lower limit based on the assumption that present expenditures for the additional years of schooling represent total costs, and an upper limit based on the assumption that, in addition to these expenditures, expenditures equal to those presently being spent must be made throughout the entire elementary and secondary career of the sample.

The model also measures education-related costs of welfare and education-related costs of crime. To obtain both these estimates, the categories of relevant expenditures are aggregated and the midpoint of the range between an upper and a lower limit is selected as being the best estimate of costs. In the case of welfare expenditures, the upper limit is established as 50 percent of AFDC, medical assistance, and general assistance expenditures, plus 25 percent of unemployment compensation. The lower limit is 25 and 15 percent of these categories. In the instance of costs of crime, the upper limit is 50 percent of the expenditures for crimes against persons and property, public law enforcement and criminal justice, foregone income of inmates, and private costs associated with crime. The lower limit is set at 25 percent of the expenditures associated with each of these categories.

### Major Findings

The results of the application of the model procedures for measuring foregone national income and foregone tax revenues to the sample of males aged 25 to 29 in the 1972 census indicated that society forfeits a total of between \$137 billion and \$82 billion in foregone income, and between \$39 billion and \$23 billion in foregone tax revenues over the lifetime of these males as a result of their inadequate education. Of the foregone national income, between \$111 billion and \$67 billion would accrue as a result of high school completion, and between \$25 billion and \$15 billion as a result of college continuance. Of the foregone tax revenues, between \$23 billion and \$14 billion is the estimated loss in federal revenues, and between \$16 billion and \$10 billion in the state and local governmental revenues. These losses represent a total societal cost of between \$178 billion and \$105 billion.

In contrast to these benefits foregone to society, the investment that would be required to provide the sample with a minimum of a high school education, plus the expenditures for those additional persons who would continue on to college, is \$20 billion. Of these costs, \$14 billion would be incurred for elementary and secondary expenditures, and \$6 billion for college expenditures.

In addition, the basic Levin procedure was used to estimate annual costs of education-related welfare and education-related crime expenditures. For the year 1973, the estimated cost of education-related welfare expenditures was calculated to be about \$7.5 billion. This includes expenditures related to AFDC, medical assistance, general assistance, and unemployment compensation. Education-related costs

of crime were estimated to be about \$10.4 billion. This amount was derived from costs of crime against persons and property, costs for public law enforcement and criminal justice, foregone income of inmates, and private costs associated with crime.

### Conclusions and Implications

The data presented in this study suggest that the schools are not "economic parasites draining off national income into some nonproductive enterprise,"<sup>1</sup> as some would contend, but instead are one of the main factors in determining its growth. In spite of the high standard of living enjoyed by most Americans, a relatively large number of people are unemployed. Unemployment often leads to poverty and welfare. Each of these conditions is related to an inferior education. The \$78,000 difference in lifetime income between the high school dropout and the high school graduate can represent the difference between owning one's own home or living in slum housing, between being able to provide for one's family or not being able to provide many of the necessities of life, or between providing one's children with a good education or committing them to an unequal educational opportunity. The findings imply that America's war on poverty can best be fought by greater attention to, and subsequent investment in, education.

Additionally, the impact of education in changing the distribution of income or providing equality of opportunity should not be overlooked. Education can be a great equalizing force. A comparison of white and nonwhite income revealed that nonwhite income as a percent of

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<sup>1</sup>William E. Rosentengal and Jefferson N. Eastmond, School Finance; Its Theory and Practice (New York: The Ronald Press, 1957), p. 6.

white income seemed to increase as the level of educational attainment increased. Thus, one result of increasing investments would not only be to raise the educational attainment of the entire population, resulting in a reduction of foregone income, but also to reduce the disparity between white and nonwhite incomes. When educational expenditures are considered to be not so much a cost to society as an investment in its people, additional expenditures can easily be justified.

APPENDIX A

Years of School Completed by Persons 25 to 29  
Years Old by Race and Sex, March 1969

Total Population (thousands)	Percent Distribution (Years)													Percent With Less Than Four Years High School
	Elementary				High School				College					
	0-4	5	6-7	8	1	2	3	4	1	2	3	4	5	
All Males--6,341	1.5	0.5	2.4	5.1	4.6	5.6	4.6	39.9	6.6	6.6	3.0	10.4	9.0	24.3
All Females--6,608	1.2	.4	2.3	4.6	5.0	7.3	5.4	48.2	5.2	5.4	2.3	9.7	3.0	26.2
White Males--5,628	1.4	.5	2.2	5.0	4.2	5.4	3.9	39.7	7.0	6.9	3.3	11.0	9.6	22.6
White Females--5,807	1.0	.3	2.1	4.3	4.5	6.4	4.8	49.7	5.5	5.6	2.4	10.3	3.1	23.4
Negro Males--654	2.4	.6	5.1	5.7	7.6	7.8	11.2	41.5	4.1	5.1	.8	5.0	3.1	40.4
Negro Females--728	2.6	1.0	3.7	6.7	8.9	15.0	9.9	38.8	2.6	3.9	1.5	4.5	1.0	47.8

# APPENDIX B

## Nonwhite Males as Proportion of All Males 25 to 29 Years Old

Educational Attainment	Nonwhite (thousands)	White	Nonwhite as Percent of Total
Less Than 8 Years	56	207	21.3
8 Years	39	190	17.0
1 to 3 Years High School	165	731	18.4
4 Years High School	298	2524	10.6
1 to 3 Years College	96	1246	7.2
4 Years College	48	845	5.4
5 or More Years College	42	630	6.2

Source (for numbers, not percentages): U.S. Department of Commerce,  
Bureau of the Census, "Educational Attainment: March 1972,"  
Current Population Reports, series P-20, no. 223 (February 1973),  
Table 1.

# APPENDIX C

## Federal and State-Local Tax Revenues as as Proportion of Personal Income, 1971 (dollars in millions)

Type of Tax	Federal	State-Local
Personal	\$ 89,517	\$ 17,334
Corporate Profits	33,132	4,216
Indirect Business	19,204	80,109
Total	141,853	101,659
Personal Income	861,382	

Source: U.S. Department of Commerce, Office of Business Economics, "National Income and Products Accounts," Survey of Current Business (July 1972), Tables 2-1, 3-1, and 3-3.

Note: Federal taxes/personal income = 16.5 percent. State-local taxes/personal income = 11.8 percent. Total taxes/personal income = 28.3 percent.



## APPENDIX D

### Calculation of Separate Current Expenditures and Capital Outlay for Elementary and Secondary Students

#### Current Expenditures:

$$\begin{array}{l} \text{Current Expenditures} \\ \text{Per Pupil in ADM} \\ \text{for 1972-73} \end{array} = (X) \left( \frac{\text{Total Number of Secondary Students in 1972-73}}{\text{Total Number of Students in 1972-73}} \right) + (.8X) \left( \frac{\text{Total Number of Elementary Students in 1972-73}}{\text{Total Number of Students in 1972-73}} \right)$$

When X = Annual Expenditure Per Secondary Student,  
then, .8X = Annual Expenditure Per Elementary Student

$$\begin{array}{rcl} \$961 & = & \frac{(X) (18,428,000) + (.8X) (27,326,000)}{45,754,000} \\ X & = & \$1040 \\ .8X & = & \$832 \end{array}$$

#### Capital Outlay:

$$\begin{array}{l} \text{Total Capital} \\ \text{Outlay for} \\ \text{1972-73} \end{array} = (X) \left( \frac{\text{Total Number of Secondary Students in 1972-73}}{\text{Total Number of Students in 1972-73}} \right) + (.66X) \left( \frac{\text{Total Number of Elementary Students in 1972-73}}{\text{Total Number of Students in 1972-73}} \right)$$

When X = Per Pupil Capital Outlay-Secondary,  
then, .66X = Per Pupil Capital Outlay-Elementary

$$\begin{array}{rcl} \$5.0 \text{ Billion} & = & (X) (18,428,000) + (.66X) (27,326,000) \\ X & = & \$138 \\ .66X & = & \$90 \end{array}$$


## BIOGRAPHICAL SKETCH

Lillian Dean Webb was born in Nashville, Georgia, on January 31, 1944. She attended public schools in Florida and received the Bachelor of Arts degree from the University of Florida in 1966. She earned the Masters of Arts in Teaching from the same institution in 1967. She majored in history for both degrees.

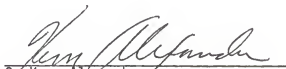
Ms. Webb served as a teacher and curriculum assistant at the junior high, senior high, and junior college levels in Jacksonville, Florida. She returned to the University of Florida as an EPDA Fellow in 1973 and completed her Specialist in Education degree in 1974. She is currently fulfilling the requirements for the Doctor of Philosophy degree with a major in Educational Administration and Supervision. Her minor is history.

While working toward the Doctor of Philosophy degree, Ms. Webb was employed as the Administrative Assistant to the Director of the Center for Community Needs Assessment at the University of Florida and as a data researcher for the Institute for Educational Finance at the same institution.

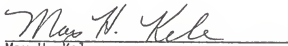
I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

  
K. Forbis Jordan, Chairman  
Professor of Education

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

  
S. Kern Alexander  
Professor of Education

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

  
Max H. Kele  
Associate Professor of History

This dissertation was submitted to the Graduate Faculty of the College of Education and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

March, 1975

  
Dean, College of Education

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Dean, Graduate School